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The celebrated American Mathematician
Editor & Translator of La Place's
"Mécanique Celeste," &c

THE

YEAR-BOOK OF FACTS

Science and Art:

EXHIBITING

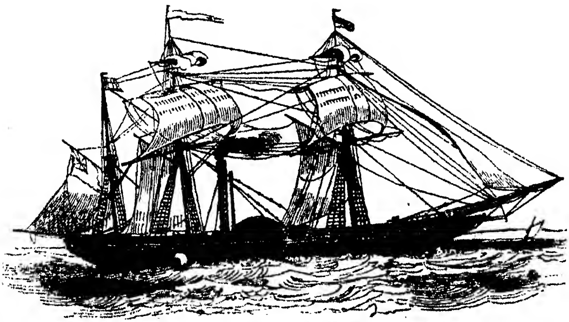
THE MOST IMPORTANT DISCOVERIES AND IMPROVEMENTS OF THE PAST YEAR,

IN MECHANICS; NATURAL PHILOSOPHY; ELECTRICITY; CHEMISTRY; ZOOLOGY AND BOTANY; GEOLOGY AND MINERALOGY; ASTRONOMY; METEOROLOGY; AND GEOGRAPHY.

Illustrated with Engravings.

BY THE EDITOR OF "THE ARCANA OF SCIENCE."

"To bring *facts* together, so as to enable us to grasp with new and greater generalizations."
PROF. SEDGWICK, *to the Brit. Assoc.* 1838.



THE BRITISH QUEEN STEAM-SHIP.

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PREFACE.

The object of the present Work is to present a faithful record of such of the results of Scientific Inquiry during the past twelve months, as bear upon the Arts of Life and Society, and tend to the advancement of Useful Knowledge. The Year-book of Facts is, therefore, the golden fruit of the great tree of Science in One Year; trusting that we have been duly vigilant of its goodly growth.

The plan of the Year-book comprises the main features of our "Arcana of Science," and something more: it will be found better adapted for general reading; its articles are more various and practical; for, by condensing and re-writing papers, omitting theoretical details, and preferring results, we have registered about One Thousand New Facts in the several branches of Useful Science. We have striven to render our Work popular, in the best sense of the term, by simplifying technicality, and only aiming at that concentration which produces high convenience. The interesting character and available worth of such information need not here be insisted on; more especially in reference to the past twelve months, hereafter to be chronicled as the *annus mirabilis* of Science; for who can point to so brilliant an epoch in her annals as the year in which are recorded the crossing of the Atlantic Ocean by Steam-power; the discovery of the North-west Passage; and the determination of the Parallax of the Fixed Stars; with innumerable other results which have long exercised the ingenuity of man, or were "never dreamt of in our philosophy." Our experience in the publication of the eleven volumes of the Arcana of Science, 1827—1837*, affords no parallel to the scientific novelties of the year 1838; and we have, accordingly, seized upon this period as a fit season for the

* The volumes of this Series, from 1832 to 1837—both inclusive, may still be had of the publisher, 143, Strand.

B 2

extension of our labours, hitherto well received by the intelligent public. Among the new features of the plan, developed in the present volume, we need scarcely point attention to the departments of Natural Philosophy, Electrical Science, and Geographical Discoveries, as an earnest of our object not being merely to record the establishment of Facts, but the progress of Science in its various applications to social improvement.

In selecting the materials of the Year-book, economy of space has, of necessity, been an important consideration; the only preference being in the adoption of such authorities as appear to report the fullest details in the smallest compass. We have read, not "to take for granted," but "to weigh and consider;" and by unsparing comparison, the best "to keep with; the rest banish;" whilst the acknowledgment of the respective sources will best shew how far each labourer in the field of Science has contributed to the glorious harvest. By adopting an uniform mode of abstract, avoiding the diffuseness of some, and the unsatisfactory brevity of others, we have endeavoured to appropriate to each subject space commensurate with its direct value: the epistolary form has been rejected as being uneconomical, and unfavourable to the elimination of special facts, and speedy arrival at results. And, without any wish to over-rate the importance of our object, it has not been one of light accomplishment: *sed labor ipse voluptas!*

Lastly, we commend this volume to the reader as one likely to make him acquainted with his own time, and remind him that it is with Science, as with the more ordinary relations of society: "if a man does not make new acquaintance as he advances through life he will soon find himself left alone." The pleasures of Science are as obvious as its advantages; and every new discovery seems to say to the inquiring mind, "Go on, and prosper!"

I. T.

3, Gray's Inn Square, Feb. 1839.

CONTENTS.

ENGRAVINGS.

THE

YEAR-BOOK OF FACTS.

Mechanical and Useful

PROGRESS OF STEAM NAVIGATION.

As the year 1838 will assuredly form a remarkable epoch in the history of Steam Navigation, it may not be uninteresting to trace the advances it has made since the year 1814, when one steam-boat, of sixty-nine tons burden, floated in solitude on the British waters.

Year.	Vessels.	Tonnage.	Year.	Vessels.	Tonnage.
1814	-	456	1826	248	28,958
1815	10	1,633	1827	275	32,490
1816	15	2,612	1828	293	32,032
1817	19	3,950	1829	304	32,283
1818	27	6,441	1830	315	33,444
1819	32	6,657	1831	347	37,445
1820	43	7,243	1832	380	41,669
1821	69	10,534	1833	415	45,037
1822	96	13,125	1834	462	50,736
1823	111	14,153	1835	538	60,520
1824	126	15,739	1836	600	67,969
1825	168	20,287			

Sec. Liverpool Statistical Society; Liverpool Mail.

M. Dupin has read to the French Academy of Sciences a paper, in which is a contrast between the relative enterprising spirit of the Government and people of the two countries. In England, the Government is always behind the people, both in enterprise and improvement: in France, the contrary. In 1835, one single commercial vessel only in France had a steam-power of 140 horses, while nine-tenths of the Government steamers were of 160-horse power: in England, on the contrary, the Government steamers did not exceed, he says, 250-horse power; while at Bristol, Liverpool, and London, vessels were fitted out of 380-horse power: the *British Queen* is of 500-horse power. If the people remained the same, and the two Governments were changed, what would be the march of improvement in England?

Judge Hall's *Statistical Notes on the West*, we learn that more than 800, probably 1000, boats have been employed on the western

waters alone since 1811. There are said to be 300 at least now. On Lake Erie, by the same account, there are fifty and more, which have carried 200,000 passengers westward this last season.

Companies have been formed for connecting our trade across the Isthmus of Darien with steamers, which are to ply on the Great Pacific Ocean between Valparaiso and Panama, a distance of about 2,500 miles; by which means the voyage round Cape Horn to Lima, which has hitherto occupied our trading vessels about four months, will, it is said, be reduced to about thirty days.

The canals for uniting the Atlantic and Pacific will, it is stated, be completed in 1839. The line of route extends from the mouth of the river St. Jean de Nicaragua, following its course to the great lake of that name, a distance of 130 miles; the line then proceeds across the lake to the coast and town of Nicaragua, ninety-seven miles; thence to Borette in the Gulf of Popaya, sixteen miles; making the total line 253 miles.

"OCEAN STEAMERS."

AMONG the triumphant successes "of British enterprise, aided by the inexhaustible resources of national art and science," the accomplishment of a steam-voyage from this country to New York is entitled to foremost record. The *Sirius* of London, and the *Great Western* of Bristol, have effected this great object, and nearly simultaneously. The *Sirius* left Cork on April 4, and reached New York on the 23rd, having accomplished the voyage in nineteen days. She encountered some severe gales; her average rate was eight miles and a half an hour; with wind fair, twelve; in moderate weather, ten. Out of 453 tons of coal, she consumed 431, and forty-three barrels of resin, which was mixed with coal ashes. Her tonnage was 700, and engines 320-horse power. On her return, she left New York, May 1, and arrived at Falmouth, May 19, in eighteen days. The winds were generally against her, and rough. Her daily rates of sailing were—153, 193, 155, 90, 106, 131, 158, 180, 225, 220, 176, 156, 172, 181, 182, 200, 227, 119 miles to Scilly. The Captain states that had his coals been good, he could have reached home three days earlier. New York to Cork is 3,300 miles; to Falmouth 3,400.

The *Great Western* left Bristol April 8, and reached New York on the 24th, thus having been fifteen days five hours on her voyage. Her daily rates were—240, 213, 206, 231, 212, 218, 241, 243, 185, 169, 206, 183, 192, 198, 230 miles, and fifty to harbour, making a total distance of 3,223 miles. Out of 600 tons of coals, she consumed only 450, having used resin, and steamed all the way. Her mean daily rate was 215 miles, and hourly nine, with unfavourable weather and strong head-winds. Reducing, to the same distance, she beat the *Sirius* by four days and a half. She left New York on her return May 7, and reached King's Road the 22d, at 10 A.M. Her tonnage is 1,340, with 450-horse power engines. It has been computed that two barrels of resin are equal to one ton of coals, and thence that, at the same expense of fuel, the *Great Western* performed nearly double the work of the *Sirius*. (*Railway Magazine.*) —The *Sirius* being found an uneconomical vessel, (her accommodation not being equal to the expenses of the voyage,) she has since been placed upon another line.

The *Great Western* affords a splendid specimen of steam machinery, constructed under the superintendence of Messrs. Maudsley and Field. The following are the dimensions of this vessel and her machinery:—

Length of vessel between perpendiculars 212 ft.; length of vessel *over all* 236 ft.; depth of hold 23 ft. 3 in.; extreme breadth of beam 35 ft. 4 in.; width from outside to outside of paddle-case 58 ft. 4 in.; draught of water (loaded) 16 ft; burthen in tons 1,340; diameter of paddle wheels 28 ft.; length of paddle-boards 10 ft.; height of centre of shafts 18 ft. 5 in.; numbers of revolutions per minute 15 to 16; diameters of shafts 15 and 16 inches; width of bearings 1 ft. 3 in.; diameter of cylinders 6 ft. 1 in.; length of stroke 7 ft.; diameter of air-pump 3 ft. 4 in.; length of stroke of do. 3 ft. 6 in.; length from centre of shaft to centre of cylinder 19 ft. 6 in.; width from centre to centre of engines 13 ft; four boilers of equal dimensions, length 11 ft. 6 in.—width 9 ft. 6 in.—height 16 ft. 9 in.; weight of engines, about 200 tons; do. boilers 100 do.; water in boilers 80 do.; intended to carry coals in tons, 600 do.; capable of carrying 800 do.; consumption of coals, one and a quarter tons per hour, when engines are in full work; or 30 tons *per diem*; 600 tons will give 20 full days' consumption; 700 do. 23½ do.; 800 do. 26½ do.

The steam is worked expansively, by which its efficiency is greatly augmented; an arrangement believed to be now first adopted in English vessels to marine engines. The valves are so arranged that the supply of steam to the cylinders can be cut off at any part of the stroke, at the discretion of the engineer, and according to wind and weather. Such, however, are but a few of the many provisions which have enabled the *Great Western* to accomplish the voyage to New York with a consumption of fuel, probably, below that of any other steam-ship of which we have authentic record: she is the property of a company formed at Bristol. In her second voyage out and home, the *Great Western* is computed to have netted about £3,000 over and above her expenses; and in her third outward voyage, £3,500.

The *British Queen*, another magnificent Atlantic steamer, has been built for the British and American Steam Navigation Company, by Messrs. Curling and Young. She is the largest vessel ever launched, and the proportion between her power and tonnage is stated to be more advantageous than that observed in the *Great Western*, than which she is less flattened: she is built, as to her beams, of English oak; the lower planks are of Dantzic fir, and the upper cedar: she is painted black, except the ornamental work around the windows at the stern, and the moulding supporting the figure-head, (a well-carved representation of Her Majesty,) which are gilt. The length of this gigantic vessel from figure head to taffrail is 275 feet, being about thirty-five feet longer, it is said, than any ship in the British navy:* length on upper deck, 245 feet; of keel, 223 feet; forty feet four inches breadth between the paddle-boxes; and twenty-seven feet one inch deep, from the floor to the under side of the spar deck. The engines are two of 250-horse power each, with cylinders seventy-seven and a half inches diameter, and seven feet stroke: they are to be fitted with Hall's patent condensers, in addition to the common ones; diameter of paddle-wheels, thirty feet. She displaces, at sixteen feet deep, 2,740 tons of water; her computed tonnage is 1,862 tons. At the water line every additional inch displaces eighteen tons and a half. Her average speed is expected to be 200 nautical miles per day, and consumption of coal thirty tons. The best Welsh coal is to be used. It is calculated she will make the outward voyage to New York in eighteen days, and the homeward in twelve, consuming 540 tons of coal out, and 360 home.—(*Railway Magazine*.) In June, the *British Queen* left the Thames for Scotland, to take in her machinery, by Mr. Robert Napier, Glasgow. Her cost is esti-

* The vignette in the title-page of this volume represents the *British Queen*, from a large print engraved by E. Duncan, after a painting by J. W. Huggins.

mated at £70,000; but, before she is ready for sea, the total outlay will not be less than £100,000.

Another vessel, to be named the ***President***, is building for the British and American Steam Navigation Company, who have also contracted with Mr. John Laird, of Liverpool, (the builder of the iron steam-vessel ***Rainbow***,) for an iron steam-ship of 1,200 tons, to be called the ***Atalanta***, and intended to run in conjunction with the ***British Queen*** and the ***President***. The latter vessel is of the same length as the ***British Queen***, 275 feet; but of larger beam, frigate-built, and of 2,000 tons.

On September 20, the *Royal William* was sent from Liverpool to New York, by a Company established at the former port. And, on October 20, the *Liverpool*, belonging to the same Company, started on her first trip, but was forced back to Cork harbour, which she finally left on November 6. The *Liverpool* was built by Messrs. Humble and Milcrest. Her burden is 1,148 tons, out of which she has stowage for 700 tons of goods. She can, besides, carry in her bunkers upwards of 450 tons of coal. Her length is 233 feet, breadth of beam fifty-six feet, and depth of hold twenty-one feet. She is fitted with two engines of 450-horse power. The diameter of her cylinders is seventy-five inches, length of stroke seven feet, and diameter of paddle-wheels twenty-nine feet; and she has two distinct sets of boilers. The stays, shrouds, and all the rigging that is fixed, or not intended to be moveable, is of a new material: it is formed of wire rods bound together with thrums, and it has the advantage of possessing great strength, and of not offering any great resistance to the air.

The *Columbus* of Liverpool, another splendid new steamer, built for transatlantic voyages, is fitted with Mr. Howard's vapour engine; and is, therefore, likewise called the "Quicksilver" Steamer. In her construction she has the appearance of an elegant brig. She has two very low chimneys, and from the peculiar coal, the anthracite, consumed by her, no smoke is emitted. She is 330 tons builder's measurement, being twenty-one feet and a half beam, and 145 feet keel, with thirteen feet and a half depth of hold. She has 110-horse power, two fifty-five feet engines, the cylinder being forty inches and a half diameter, and three feet and a half stroke, and wheel seventeen feet and a half diameter. Her speed through the water is ten statute miles per hour. Mr. Howard applies the furnace, not immediately to the water, but to a pan of quicksilver, which he proposes to maintain at a temperature below its boiling point, but very much above the boiling point of water. On the surface of this hot quicksilver he injects the water, which is converted instantly into steam containing much more heat than is sufficient to maintain it in the vapourous form. This super-heated steam is used to work the piston; and being subsequently condensed by means of a jet of fresh water, the mixture of warm water, produced by the steam and the water injected, is conducted through the cooling pipes, and subsequently used, to supply the water evaporation; thus not only dispensing with the boiler, but also with sea-water, the same distilled water constantly circulating through the cylinder and the condenser. So great is the economy of fuel aimed at by this contrivance, that, should it succeed, it must put every other form of marine engines altogether out of use. The experimental results have been very satisfactory. A small boat fitted with Howard's engine has been plying between the metropolis and Richmond during the past summer.

The *Rainbow*, built by Mr. John Laird, of the Birkenhead iron-works, Liverpool, for the General Steam Navigation Company, is a large iron steamer: she is 580 tons, 190 feet between the perpendiculars, 198 on deck, twenty-five feet beam between paddle-boxes, twelve feet eight inches depth of hold, with engines having fifty inch cylinders, four and a half feet stroke, and 180-horse power. She plies between London and Antwerp, and has made the trip in sixteen hours and fifty minutes, (the quickest passage having hitherto been made in nineteen hours and a half,) and beat a wooden steamer by six hours: her motion is so gentle that a letter may be written in the cabin with ease. In this vessel Professor Airy has experimented on the effect of the iron on the compass. *(See page* 333 *of the present volume.)*

On October 18, the *Archimedean*, built upon a new principle, was launched from the yard of Mr. Wynn, of Mill-wall: the objects attainable being speed, and the ready application either of steam or sailing power. The engine is placed amid-ships, as in the steam-vessels already in use, and the propeller, or paddle, which is under the stern, is to be worked by a communicating shaft, acting upon "the screw of Archimedes," in the application or use of which the invention is grounded. The propeller being placed under the stern, the inconvenience arising from paddles now in use, which act themselves as a backwater, is avoided; and great benefit will be derived in seas when the wind is on the beam, when, instead of a great portion of the power being lost, as now, the paddle will work as effectually as in calm weather. Should it be desirable to remove the steam-power, the same may be immediately unshipped, and its action may be stopped, and sailing power substituted. The dimensions of the vessel are:—extreme length, fore and aft, 125 feet; length between perpendiculars, 107 feet; breadth of beam, twenty-two feet six inches; depth of hold, thirteen feet; diameter of screw, seven feet; length of screw, eight feet; engines of forty-five-horse power.

H.M. Steam Frigate, Gorgon.—Notwithstanding her immense bulk and her draught of water, thirteen feet forwards and fourteen feet six inches abaft, in an experimental cruise, she speedily attained a velocity of eleven miles and a quarter per hour, the engines making nineteen strokes and a half per minute; and yet with this great speed there was not the least sensible vibration on board; a tumbler of water placed on the taffrail, as well as on the paddle beam, right over the engines, remained undisturbed. The total freedom from vibration or concussion in this ship, may be attributed to two important causes; first, to the admirable construction, by which the vessel may be said to be from stem to stern like one solid piece of timber; and, secondly, to the important improvement adopted in the engines, (Messrs. Seaward's,) 320-horse power, whereby a mass of moving material (sway beams, side rods, cross heads, &c.) of forty-five tons weight is dispensed with, and the energy of the piston is at once carried to the paddle-shafts, and the whole force of action and re-action confined within the base of the cylinder upon which the engine stands. The consumption of fuel, ascertained by weighing, was one ton of Welsh coals per hour, equal to seven pounds per horse, per hour, at full speed. The coal-boxes, holding four hundred tons of coals in the engine-room, will be sufficient for seventeen days' consumption at full speed; ten days' more coal may be occasionally stowed in the fore and after hold, making, in the whole, fuel for twenty-seven days. This, at an average

speed of nine miles, will carry her a distance of 5,800 miles by steam alone. This steam frigate will carry, besides the crew, 1,000 troops, with stores and provisions for two months. Four months' cruizing on the coast of Spain has fully established the superiority of the *Gorgon's* engines; and the splendid frigate *Cyclops*, building at Pembroke, is to be fitted up on the same plan. The Russian, Lubeck, and St. Petersburg Company's ship, building in the Thames, of 900 tons, is also to be fitted with Seaward's engines, of 240-horse power; as well as a man-of-war for the East India Company, of 240-horse power. So compact is this plan of engine, that the engine-rooms in the two latter vessels are only forty-five feet long, with stowage for 120 tons of coals; whereas, with common beam-engines of the same power, sixty feet would have been required; making a clear saving of fifteen feet in the widest and most valuable part of the ship.—*Abridged from the Mechanic's Magazine.*

The Queen of the East is a magnificent iron steam-ship, the first of a line of steamers to ply between England and Calcutta; designed by Mr. W. D. Holmes, engineer to the Bengal Steam Committee. She is of 2,618 tons and 600-horse power, and, though built of iron, draws but fifteen feet at her greatest immersion: extreme length, 310 feet; length of main deck, 282 feet; length between perpendiculars, 270 feet; length of principal cabin, 128 feet; number of private apartments for passengers, sixteen; number of beds for ditto, 400; width of beam, forty-five feet; depth of hold, thirty feet; tonnage, 2,617 tons, 39-94ths; immersion at load water line, fifteen feet; engines, horse-power, 600; cylinder, eighty-four inches diameter, and nine feet stroke.

The *India*, the first vessel of the India Steam Navigation Company, by the Cape of Good Hope, has been built by Messrs. Scott and Sons, and the engines by Messrs. Scott and Sinclair, of Greenock: she combines the advantages of the *Great Western* and *British Queen*, both in build and comfort; is supplied with baths: and Her Majesty's steam frigate *Medea*,* has been chosen as the model for her sails and masting. In extreme length, she is 201 feet; in breadth, 40; and in depth, 25; of 1,200 tons burthen; with accommodation for eighty cabin passengers, and 400 tons of goods. She is fitted with Collier's patent boilers, is provided with a safety apparatus, and built with two strong bulk-heads of plate-iron across the engine-room, to confine accidental fire, and prevent a leak in one division spreading to another. The *India* is expected to proceed on her first voyage in April next; and should she arrive even in seventy-two days, the Company will, (according to their latest prospectus,) be entitled to a bonus of £2,000, the balance in hand of the old Calcutta Steam Society's Fund. It is also announced, that another vessel of 1,500 tons burthen is on the stocks, that a third will be ready within eighteen months, and that three more are about to be commenced. With this number of vessels, it is expected that twelve voyages out and twelve voyages home will be performed in each year, allowing fifty-five days to accomplish the distance from Plymouth to Calcutta, by the Cape of Good Hope; thus avoiding the many difficulties of the Red Sea line, as change of vessels, monsoons, the plague, the desert, piracy, &c.

An iron steam-ship, 145 feet long, and twenty-five broad, has been built by Messrs. J. and W. Napier, of Glasgow; she is intended for

* Such has been the progress of this vessel, that there have been taken from the Medea's flues, after a week's steaming, sixty bushels of soot.

South America, and can carry 1,000 passengers. On being launched, this vessel drew only eighteen inches of water, and with machinery and cargo will not exceed three feet.

The *Aurora*, entirely of Irish manufacture, has been built by Messrs. Connelly, of Belfast: she is unexceptionable for the beauty of the lines from the paddle-boxes to the stem, and the gentle curvature from the bends to the gunwale, so much admired in the best Clyde-built steamers; while speed, large tonnage, and light draught of water are combined in her. Her dimensions are:—Length on deck, from head to stern, 170 feet; breadth betwixt paddle-boxes, 23 feet; actual admeasurement, 453 tons; estimated burden 750 tons: engines, 240-horse power.

Captain Bechameil has fitted out the French Government steamer *Véloce*, with his new invention for working the vessel either with sails or steam: she left Rochfort for Mexico, and was fallen in with by a Spanish ship, in 40° of north latitude, and 14° of longitude, W. of Paris. When under sail, with her topsails, studding-sails, and royals set, her rate for two days and a half, was eleven and a half knots an hour. It has been ascertained that all her canvas, amounting to fifty-four pieces, may be taken in in forty-five minutes, and set again in fifty minutes.

Steam Barge.—A steam-barge voyage has been performed between London and Oxford. The paddle-wheel is in the stern, and other contrivances are introduced to facilitate river navigation, the passage of locks, &c.—*Literary Gazette.*

FORM OF STEAM VESSELS.

Mr. J. S. Russell, in a paper read to the British Association, has detailed the two great experiments recently made in Steam Navigation, and shewing the importance of the form of the vessels. "Two fifty-horse power engines had been taken out of a vessel, and two sixty-horse power engines put in their place. When the propelling power was two fifties, the velocity of the vessel was ten miles and three quarters per hour. When it was two sixties, the velocity with which the vessel moved was ten miles and six-tenths per hour. Here was an increase of power, a greater expenditure of fuel, and the increase of the velocity was only three-tenths of a mile. Another experiment was made on two vessels, one of 450 tons and the other of 500 tons burthen. The larger vessel was propelled by two engines of 300-horse power, and the smaller one by two of 150-horse power. The larger vessel, with the double power, proceeded at the rate of nine miles and a half an hour, whilst the smaller one moved at the rate of nine miles and a quarter an hour. This instance he thought extremely satisfactory; the smaller vessel had the proper form that a vessel should have, and the larger one had not. He was, therefore, of opinion, that the form of the vessel was the direction in which we should look for improvement. Indeed, he thought it probable, that ere long we should have vessels of double the length, for a given breadth, that they at present generally are. The objection to an increased length from the danger of what is called "breaking the back," might be in a great measure removed by a proper system of diagonal framing. Another important consideration is, that the linear dimensions of a vessel being doubled, the capacity is increased eight-fold, but the increase in the resistance need not be more than two-fold."—*Athenæum.*

PADDLE-BOARDS.

IT appears from the Report of the Irish Railway Commission, that great mistakes have been made in the size of paddle-boards. Their area has been successively reduced from about twelve to eight feet, and the speed of the vessel has been accordingly increased. But, what is still more remarkable, the tremulous motion was reduced at the same time; the maximum effect being something above six feet.—*Railway Magazine.*

APPARATUS FOR PROPELLING STEAM-SHIPS.

MR. J. J. O. TAYLOR, of No. 51, Gracechurch-street, has exhibited some models of vessels propelled by an apparatus intended to supersede the use of paddle-wheels. When applied to steam-ships, it is to be worked by steam as the paddle-wheels, but with this difference:—The power of the steam engine will be brought to bear upon a horizontal iron shaft which will pass from the engine, or closely in position with it, beneath the deck of the main cabin, through the stern-post of the vessel; at the extremity beyond the stern-post, two blades, in shape like the blade of an oar, will be fixed, not perpendicularly, but at an angle of twenty-two degrees to the perpendicular stern-post; and beyond these blades, which occupy but little space, will be affixed a false stern-post, secured to the real stern-post. The rudder, will of course, be attached to the false stern-post. The iron shaft being put in motion by the power of the steam-engine, revolves with great rapidity, and at each stroke drives the blades through the water. The vessel is thus propelled forward in precisely the same manner as a wherry is seen to be frequently propelled in the river, by a man at the stern using one oar or scull to force it forward.—*Times.*

PREPARED FUEL FOR STEAMERS.

A SERIES of trials has been made at Woolwich Dock-yard with "prepared fuel" for the use of Her Majesty's steamers. This fuel is a composition of "screened" (otherwise almost uselessly small) coal, river mud, and tar, cast into brick-like moulds. In an engine worked with it, the consumption for six hours forty-five minutes, was 750 pounds; the same engine, for the same period, requiring 1,165 pounds of north-country coals to keep it going; shewing a saving of 415 pounds in favour of the new fuel. Next day, Welsh coal was used, and 1,046 pounds were consumed; and next, 1,098 pounds of Pontop coals were consumed during the six hours forty-five minutes; the engine easily performing the same work with 680 pounds of the prepared fuel; thus shewing a reduction of 418 pounds in favour of the invention. On the average of consecutive days, it required about fifty pounds less of the prepared fuel to get steam up, which was not only better maintained by very little feeding, but more readily obtained by the inflammable nature of the material. It has besides the advantage of being stowed away in a compact state, and not liable to act as a shifting ballast.—*Abridged from the Shipping Gazette.*

SPEED OF THE AMERICAN STEAM-BOATS.

MR. W. S. REDFIELD, of New York, has addressed to Lieutenant Hosken, the commander of the *Great Western* steam-ship, a letter, in which he says: "There is, if I mistake not, some misapprehension prevailing both in England and America in regard to the ordinary as well as maximum speed of the best steam-vessels. This is mainly to be ascribed to three causes: 1st. The erroneous statements which often find

their way into newspapers. 2nd. To a mistaken estimate of the velocity of the tides and currents; and 3rd. To the erroneous popular estimate of navigating distances, which on nearly all internal or coasting routes in both countries, so far as my knowledge extends, are habitually overrated. This may explain, on one hand, the extravagant claims to velocity which are sometimes stated of American steam-boats; and, on the other hand, may account for the strange incredulity which has been manifested by Dr. Lardner and others, not well acquainted with the structure and performances of American steam-boats. The acquaintance which I have had with the navigation of the Hudson by steam, during the last thirteen years, enables me to speak with confidence on some of the points involved.

"The ordinary working speed of the best class of steam-boats on the Hudson may be estimated at fourteen statute miles per hour, *through still water of good depth.* That they are not unfrequently run at a lower speed is freely admitted. But the maximum speed of these boats *is, and has been for several years, equal to about sixteen miles per hour.* In regard to the 'admitted four miles per hour tide up the Hudson,' the admission is extremely erroneous. The average advantage to be realized in a passage on flood tide from New York to Albany, is not more than one mile and a half per hour, or, at the most, say twelve miles in a passage to Albany,—equal to about one-twelfth of the distance as performed under the most favourable circumstances."—*Abridged from the Athenæum.*

PROGRESS OF RAILWAYS.

Our notices of these stupendous works are, of necessity, restricted to such of the British Railways as have been opened to the public during the past year; to which are added a few incidental facts briefly but powerfully illustrating the general progress of the system; the most important improvements being otherwise specified.

The London and Birmingham Railway was opened throughout on September 17, 1838: the first train completing the distance, 112½ miles, in four hours and fourteen minutes; and the second train, carrying 200 passengers, in about six hours. The entire cost of this railway will be £5,000,000; one of its most laborious works is the Kilsby Tunnel, 2,598 yards in length, the expense of which is stated at £400,000. With the exception of the inclined plane between Euston Grove and Camden Town, the least favourable inclination is equal to only one in 330, or sixteen feet in a mile; only about thirteen miles of the road are perfectly level, the remainder forming a series of inclined planes; and the station at Birmingham is 250 feet above the level of the London station. The cost of the iron rails is stated at £460,000; their weight, 35,000 tons; cost of stone blocks, £180,000; weight, 152,460 tons: total excavations, 15,000,000 cubic yards. The weekly receipts are about £10,900; the most busy day being December 22, when the receipts amounted to about £1,800; engineers, Stephenson and Son.

On July 20, one of the Birmingham directors started with Marshal Soult at half past four in the morning, reached Denbigh-hall, forty-seven miles and a half from London, returned to town, and was at breakfast two miles and a half from the station at 9 o'clock the same morning.

An illustrated description of this railway, is now in course of publication upon a scale commensurate with the national importance of the subject. This work consists of a series of lithographed drawings, executed in the new style of the art by Mr. John C. Bourne; with accounts of the

origin, progress, and general execution, of the line, by Mr. Britton, F.S.A. As the drawings will represent the actual progress of the works, the details must be full of instruction; whilst their brilliancy of execution, to quote a contemporary, "is an example of the application of artistical skill to the illustration of railways, which we hope to see followed with respect to the other great lines of England."

The North Union Railway was opened from Parkside, (the spot on the Liverpool and Manchester Railway, whereon Mr. Huskisson was killed,) to Preston, on October 21; and the distance, twenty-two miles and a half, run in forty-five minutes. This line, with the Grand Junction and Birmingham, opens a continued line from London to Preston, 219 miles in length. It has some sharp inclinations of fifty-three feet per mile, and embankments sixty feet high: probably, the most remarkable feature on this line is the wooden bridge over the Yarrow, 400 feet long, 73 feet above the bed of the river, and said to contain 30,000 cubic feet of timber; 1,400 passengers daily; engineer, Vignoles.

The Newcastle and Carlisle Railway, sixty-one miles in length, was finally opened on June 18th, with eleven trains, taking between 3,000 and 4,000 passengers.

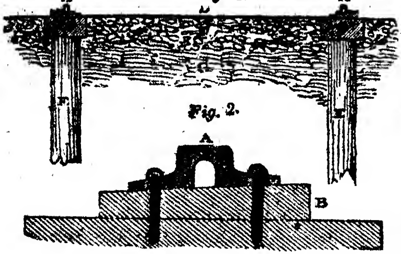
The Durham Junction Railway, connecting the South Durham Coal-fields and South Shields, was opened early in September. Its noblest work is the magnificent "Victoria Bridge," by which the rails are carried across the Wear. Its entire length is 270 yards, and its width, within the parapet walls, twenty-one feet. There is a double line of railway over the bridge, with a flagged causeway for foot passengers. According to the *Newcastle Journal*, the arch over the river Wear is 160 feet span; from the foundation of the pier to the spring of this arch is seventy-two feet; from the spring to the crown of the arch is also seventy-two feet; and from the crown of the arch to the parapet wall, is thirteen feet; making, in all, 157 feet. From this, to obtain the height for the ordinary water level, we must deduct the solid masonry buried beneath the waves, which makes the observable walling 130 feet. This is considerably higher than the celebrated Sunderland Bridge; and, taken as regards height and span, it is the largest arch in Europe. True it is that the arch of the bridge over the river Dee, near the city of Chester, is wider, and the bridge at Alcantara is more lofty; but, taking into consideration the united difficulties of extent of span and height from the water level, the Victoria Bridge must stand unrivalled.

The Sheffield and Rotherham Railway was opened on October 31, when the journey (five miles, twenty-seven furlongs, twenty-five yards) was performed in fifteen minutes. The entire cost of this railway is stated at £150,000. Its average rise from Rotherham is eleven feet per mile; earthworks, about 372,000 cubic yards; loftiest embankment, eighteen feet; deepest cutting, forty-one feet; traffic, 2,000 daily; engineer, F. Swanwick.

The Great Western Railway was opened from London to Maidenhead, twenty-three miles, on June 4: the number of passengers has exceeded those on any other line, and the rate of travelling is greater; the velocity mostly exceeding thirty miles per hour; during September last, the fares amounted to £7,579. The estimated cost of the whole line, 117 miles, is £4,560,928; exclusive of locomotive engines and carriages; engineer, Brunel.

As this Railway deviates from the ordinary mode of construction, the following details may be interesting:—

Fig. 1.



SECTION OF THE GREAT WESTERN RAILWAY.

A A wrought-iron rail screwed down to sleeper; B a featheredge or wedged-shaped board of oak; C C sleepers of timber; D iron tie-bar to connect the two sleepers; E E piles eight feet long, and eight inches diameter, pointed at the lower ends; F ballasting; G embankment.

On the embankments, piles of beech trees, Kyanized, about eight feet long, and eight in diameter, are driven by a pile-engine, at distances of fifteen feet apart, on each single line of rails, and so arranged that the piles of the corresponding rail are placed opposite to the intermediate distances, and not opposite to each other, thus: ⚬ ⚬ ⚬ ⚬ ⚬ upon these piles are laid longitudinal continuous sleepers of Memel timber, Kyanized, thirteen or fourteen inches wide by six and a half or seven inches thick, which are firmly bedded on the ground, previously made even and well rammed; on the top of the sleepers are laid the rails, with an intermediate distance of seven feet half an inch in clear of the rails; between the rail and the sleeper is a featheredge or wedge-shaped board of oak, or hard wood, eight inches wide and one and a half inch thick on the outer edge, and one and a quarter inch thick on the inner edge, which gives the rails a slight pitch inwards, so as to make the top coincide with the levelled or conical rim of the wheels, which touches the rails with a bearing equal to the width of the top of the rails, instead of a point, as in the ordinary mode of laying them. The rails are of wrought-iron, rolled in lengths of fifteen feet, as shewn in figure 2, and made hollow; the top is two inches wide, base six inches, and height one inch and three-quarters: holes are punctured in the flanges on both sides, about eighteen inches apart, to secure the rail (*without chairs*) to the sleepers, by means of screws eight inches long. To prevent the sleepers from spreading, there are, at every fifteen feet, iron ties across the railway, spiked down at each end to the sleepers; the surface of the roadway is finished with ballast in the usual manner.—*Civil Engin. and Arch. Journal.*

The bridge over the Thames at Maidenhead contains arches of the largest span yet attempted in brick in this country, or probably, in any other. The two arches are 128 feet each span, and the pier in the centre of the river is 8 feet wide.

The carriages of the Great Western Railway, by Davis, of Wigmore-street, are of excellent build and accommodation, and cost £400 each; some are eighteen feet long and eight feet wide, and others twenty-one feet long, and eight feet wide. The centre of the roof, or ceiling, is raised to give headway, and is sufficiently high for a tall person to walk upright; on each side of the raised ceiling are copper gauze, wire pannels for ventilation, regulated by wood slides or shutters.

During the hurricane on the morning of October the 29th, four car- [illegible] wind, from Maidenhead along the Great Western Railway; two to Slough, and two to Wormwood Scrubs.

Owing to dissatisfaction among the shareholders, this line has been surveyed by Messrs. Wood and Hawkshaw, who have published voluminous reports thereon; which, however, are not very decisive. The

policy of the broad gage (seven feet) is still disputed: Mr. Herapath observes, "experience has proved four feet eight inches to be too sm--" but we are not aware it has yet proved that seven feet is too large."

The London and Southampton Railway was opened to Woking Common, twenty-three miles, on May 21; and on September 29, to Shapley Heath, fifteen miles further; average daily passengers, 940: the whole line to be opened in the spring of 1840.

The London and Greenwich Railway was opened throughout, on December 24; engineer, Landmann. From January 1, 1837, to December 17, 1838, that is, one year eleven and half months, there have been carried on this railway 2,974,801 persons, without a single accident.

COLMAN'S PATENT RAILWAY.

THE model of this new system has been exhibited by the inventor, in Carlisle-street, Soho-square, and has elicited a great contrariety of opinions. It possesses considerable ingenuity, and aims at very important objects.

The carriages are not to run on edge-rails, but on broader iron plates, fastened down to longitudinal timbers; the wheels will revolve independently on the axle, (as in common carriages,) which may, therefore, have any shape between the wheels. To the fore and hind axle, the mainbeam of the carriage is fastened by two vertical bolts or pins, round which the axles turn horizontally. In the plane of the horizon perpendicular to each axle is fixed a strong arm, about half the length of the axle; both projecting from the centre of the carriage, the hind one, of course, backwards, and the front one forwards. Herein consists a material part of the invention: for beneath each of these arms on four vertical axles are fixed four guide-wheels turning horizontally—two of them being made the axle, and two of them towards the further end of the arm. The circumferences of each pair just admit between them a vertical iron guide-plate, which traverses the entire centre of the railway, and is fixed in the ground; thus keeping the bar of the axle in the direction of, the axle itself at right angles to, the centre-line of road. Hence each pair of the carriage-wheels, whether in a curve or not, is always moving parallel to the road, and revolving on the axle without any additional friction except that of the guide-wheels.

The next part of the invention relates to a point of still greater importance: the ascending of inclines, and the consequent saving, if the plan succeeds, of heavy cuttings and embankments. For this purpose, outside the working-wheel of the engine is a projecting rim or tire, roughened and concentric to the axle of the wheel, but of a less diameter. When the engine begins to ascend an incline, this projecting tire comes upon a rail raised on the outside of the rails to such a height as just to lift the working-wheels from the ordinary rails of the railway, so that these may now run on the roughened rim. By this means, the circumferences which are run on, being actually less in diameter, the engines will have a proportionate advantage of leverage to meet the greater draught; and Mr. Colman conceives the roughened surface will augment the adhesion or bite of the wheels. Of course, the velocity will be diminished in proportion to the diameter of the wheel to the roughened rim, if the inclination be such as not to alter the pressure in the cylinder. In this plan the working-wheels are worked by separate cylinders. There are several other novelties in the details; but the above are the main points.

Among the advantages which would result from the adoption of this invention, Mr. Colman enumerates the following:—1, the reduction of the enormous dead weight in the carriages; 2, the lowering of the centre of gravity of the load by placing the bodies between cranked axles, and thereby increasing the safety; 3, having the wheels convex instead of flat, so as to reduce the points of contract with the road, and materially lessen the friction; 4, by being able to run round any curves, and ascend greater acclivities, to reduce very considerably the expense of constructing the road, either in the saving of costly cuttings and embankments, or going round, instead of through, valuable property, which, in the latter case, must be purchased.—*Railway Magazine*, No. 34; which see for the Editor's remarks.

NEW LOCOMOTIVE.

MESSRS. HAWTHORNE, of Newcastle, have constructed a locomotive engine invented by T. E. Harrison, Esq., of Whitburn, and differing essentially from any hitherto in use:—1. The machinery and boiler are placed upon separate carriages and wheels, thus giving the conducting engineer an unobstructed view, and placing almost the whole of the machinery within his reach. This arrangement also obviates the removal of the boilers, or "stripping of the engine," which is almost equivalent to rebuilding it: it likewise prevents delay, since the defective boiler can be detached in a few minutes, and another boiler united to the engine; or, if the engine be defective, *vice versâ*.—2. The machinery thus constructed is capable of being made more substantial, every part bearing a ratio of strength to a standing engine. An opportunity is also afforded of getting up a very considerable increase of speed (at the same time keeping down the destructive velocity of the piston,) either by having wheels of larger dimensions, or, as in the present engine, by means of toothed-wheels which give the revolutions to the driving-wheels, for each stroke of the piston; the great advantage to be derived from which can only be appreciated by those whose experience has enabled them to estimate the destruction by wear and tear attending such extreme velocity being given to the piston, not to the machinery only, but also to the fire-box, owing to the great pressure and velocity by which the steam is injected into the chimney, thereby raising the temperature of the fire to such an extent as greatly to hasten the consumption of the material it is made of, whether iron or copper.—3. The boiler is of the same construction as those of other locomotive engines, except in the fire-boxes, which have two doors; and is divided into two parts by a chamber or reservoir suspended from the top; which, therefore, by presenting a greater area of heating surface to the action of the fire, hastens the generating of steam without increasing the temperature.

TIMBER VIADUCTS FOR RAILWAYS.

MR. THOMAS GREEN has constructed on the Newcastle and North Shields Railway, at Wellington Dean, a bridge, which is as new in principle as it is magnificent in structure, and will, probably, form the example for viaducts in this part of the country, where its relative economy will be very considerable. Its total length is 1,150 feet, and it consists of seven arches, five of 126 feet span each, and two of 116 feet each; the maximum height being eighty-two feet. The great novelty is its having wood, instead of iron, brick, or stone for its arches; and its not being constructed with straight timbers, as wooden bridges usually are. Each

arch is stated to be the segment of a circle of 120°, and consists of three ribs, each being two planks or twenty-two inches wide, and fourteen planks or three feet and a half deep. These planks are banded together, and each rib springs from an iron socket in the stone pier firmly bolted to it. In each rib every alternate course of deals is laid in a whole deal and two halves, for the purpose of breaking the joints, and between every deal is a layer of brown paper dipped in tar. Strong wooden principals go from the crown of the arch, where they are bolted and banded to the piers; from them wooden struts go to the arch, and meet it perpendicularly, whilst other struts issue from where the former meet the principals to the roadway, also perpendicular to it. By this means, the materials are subject to no lateral, but only tensile and crushing, forces. The roadway is twenty-two feet wide, and the cost estimated at £21 per foot run of the bridge: the timbers are Kyanized. This bridge, it is calculated, will cost one-third less than if built of stone; and, if this be the case where stone is so cheap, the saving in the metropolis would be one-half.—*Railway Magazine.*

Close to Newcastle, on the same railway, another bridge has been constructed on the above principle: it has five wooden arches, and four of stone; each of the former being 116 feet span, and the latter, 43 feet each; total length of the bridge 950 feet; greatest height, 108 feet.

SELF-RECORDING STEAM JOURNAL.

DR. LARDNER, not having succeeded in obtaining from the men on board steam vessels all the various facts required to be registered, has constructed for the purpose, an instrument, which he terms a Steam Journal. By this instrument, he proposes to register every five minutes the following varying phenomena, on which the efficiency and performance of steam-engines depend:—the pressure of the steam between the slides and the steam-valve; the pressure in the boiler; the vacuum and the quantity of water in the boilers; the saltness of the water in the boilers; the velocity of the paddle-wheels; the draft of the vessel; the trim of the vessel; the rate of the vessel; the course of the vessel; the apparent force of the wind; the apparent direction of the wind. All these, excepting the course of the vessel, it is intended to register by self-acting mechanism. The methods by which this is to be effected were explained, by reference to detailed drawings, by Dr. Lardner, at the late meeting of the British Association.

BOILER-MAKING MACHINERY.

MR. FAIRBAIRNE has invented a machine, by which two men and two boys can fix eight rivets three-quarter inch diameter per minute, or nearly 500 per hour; whereas, by the ordinary operation, with an additional man, not more than forty can be inserted; thus, the advantage is about 120 to one, besides the saving of one man. By this machine, an ordinary locomotive boiler, ten feet six inches by one foot diameter, can be rivetted, and the plates fitted, in *four* hours; whereas the time required, besides extra hands, without this machine, would be *twenty* hours. The work is also much superior. The rivets being hot, the holes are completely filled, and the rivet by its contraction draws the plate so closely together, that the joints are perfect. On testing a high pressure boiler made by this machine, to 200lb. on the square inch, there was no leakage; but in a boiler made by hand, very many of the rivets would be found to leak. *Proc. Brit. Assoc.—Athenæum.*

HALL'S PATENT STEAM CONDENSERS.

The great advantages of this improvement in the method of condensing the steam in marine engines, has been shewn in two trials of the *William Wilberforce* Hull steamer. On one occasion, the barometer indicated a vacuum in one engine of $29\frac{5}{8}$ inches of mercury, and in the other $29\frac{3}{8}$ inches, the engines making 21 strokes of six feet per minute. The advantages attending Mr. Hall's patent condensing engines in heavy gales and storms at sea are truly surprising; for it matters not how hard it blows, or how heavy the sea rolls, the same uniform power is maintained as in a calm; and while common engines, under similar circumstances, cannot keep up the vacuum to a higher point than from 20 to 25 inches, the patent engines obtain a steady vacuum of from 29 to $29\frac{3}{4}$ inches. *Hull Observer;* quoted in *Mechanic's Magazine.*

USE OF STEAM IN THE ECONOMISING OF FUEL.

Dr. Fyfe having caused steam to pass through a poreclain tube, stuffed sometimes with charcoal, sometimes with coke heated to redness in a furnace, collected the resulting gas, generally over a water trough, but sometimes over mercury. His inference from a variety of experiments is, that the gas contains hydrogen, oxygen, and carbon, and that the two last are in the state of carbonic oxide. Hence the combustion of the gas gives rise to the formation of carbonic acid and water.

When air was freely admitted to the incandescent material, at the same time that steam was driven through it, Dr. F. found that the water of the steam was, in part at least, consumed, and that the heat was thereby augmented. This was proved by the greater quantity of water evaporated in a given time. On an average, for each ounce of steam thrown into the furnace, there were four ounces additional evaporated, over and above that evaporated without the transmission of steam, provided the steam was thrown in cautiously. This increase of temperature by the use of steam as a fuel was not effected at the expense of a greater quantity of fuel, for there was rather less fuel consumed when steam was transmitted through it than when emitted, at the same time that the quantity of water evaporated was increased. To arrive at correct results, it is necessary to throw the steam in cautiously. It is thus proved that water, while passing in the state of steam through fuel, not only acts as a sort of blast, but, at the same time, itself undergoes combustion, by the formation and consequent consumption of inflammable gaseous products; and the increase of heat, Dr. F. thinks, will more than compensate for any extra expenditure for converting the water into vapour. Dr. Fyfe's experiments will be found at length in Jameson's

PATENT SMOKE CONSUMERS.

Mr. Ivison, of Edinburgh, has patented an invention by which the smoke that usually proceeds from the stove of a steam-engine is consumed, and a consequent proportionate saving of fuel effected.

At the commencement of an experiment, the steam in the boiler was at a working temperature. The cistern from which the boiler is supplied was filled, and 392 pounds of coal weighed to the stoker; at half-past two o'clock the engine went to her work, and as the cistern required additional water, from the evaporation going on, it was measured in; the whole quantity taken during the experiment of five hours' duration, being 504 gallons, or 5,040 pounds. At half-past seven o'clock, the furnace, boiler,

and cistern, were examined, and found to be in a similar state to that in which they were when the experiment was commenced; the consumption during five hours being, as already stated, 392 pounds of coal, giving a result of 5,040 pounds of water evaporated by one pound of coal; thus proving that an increase of steam equal to 115 per cent. had been acquired by the application of the process of simply throwing in a jet of steam upon the fire. The importance of the process will be readily acknowledged. We may remark that the action exerted on the fuel by the steam is similar to that which takes place when steam is passed through tubes charged with ignited carbon, and excluded from the air, viz. the steam is itself decomposed, indeed burnt: as its oxygen unites with the carbon or smoke, its hydrogen is set at liberty, and both being highly inflammable, thus add to the amount of heat evolved, whilst smoke is prevented and fuel saved.—*Abridged from the Mining Journal.*

Messrs. Chanter and Gray, of Blackfriars, have patented an apparatus; its principle consisting in so arranging the form of the furnace and position of the bars, that the fuel is regularly advanced by gravitation, upon inclined fire-bars, without the aid of extra machinery. The carbon and inflammable gases are set free in the process of combustion, and being more charged with the oxygen of the atmosphere and heat of the fire, proceed through and over the fire, which increasing in heat to its termination, gradually subjects the less combustible gases to perfect combustion. Saving in fuel is thus effected; for, in the present furnaces, these gases are not only passed off unconsumed, but by preventing the ignition of more combustible materials, necessarily waste a large portion of the burning fuel.

This invention is applicable to every description of furnace; the details are somewhat varied; but the most important part of the principle, namely, the absolute consumption of the vapour, is thus effected in all of them. In the adaptation of the smoke-consumer to a locomotive engine, the furnace is made raking, or inclining downwards at a considerable angle, so that the fuel gradually slides down as it becomes consumed. The furnace is thus charged: the coals are laid within the door, so as to completely fill the mouth of the furnace, (and are not thrown into the centre, as is generally adopted in the ordinary furnace;) and here the coal is converted into coke, by the intense heat of the burning fuel below; the smoke and gases arising from the fresh fuel are driven, by the great draught passing between the bars from the ash-pit, against the inclined surface of the underside of the boiler; whence it is reverberated on to the burning fuel, and completely consumed. In the ash-pit is placed a grating, or save-all, to catch the small coals which may drop through the bars, where they are consumed; and the heat arising therefrom passes into the furnace above, thereby saving a considerable portion of fuel. Not a particle of smoke escapes from the chimney; and several of the most eminent engine-makers, on witnessing the consumer in operation, have agreed that it effects a perfect consumption of the smoke.—*Abridged from Civil Engin. and Arch. Journal.*

SAFE RAPIDITY ON RAILWAYS.

MR. SANG, F.R.S.E. of Edinburgh, in a late number of Jameson's *Journal*, states as the result of his observations on the Liverpool and Manchester Railway, that a speed much greater than the present twenty-five miles per hour, may be used with safety. The question is, whether

with a velocity of three or four times the usual rates, the engineer can preserve perfect command of the powerful locomotives required.

Mr. Sang remarks, that "with the velocity of twenty-five miles an hour, even when exposed to the current of air, there was not the slightest approach to any feeling that would lead me to suppose that four or five times the velocity would disable the engineer from directing and managing the train. Thus, when the train arrives at the foot of one of the inclines, the banking-engine follows to assist it up. Now one would be apt to imagine, that for the purpose of attaching the new engine, the train would stop, or that if it did not, there would be a concussion when the banking engine comes in contact. So completely, however, are these powerful engines under the control of their directors, and so well are they managed, that a passenger in the train who is not aware of what is going on from ocular perception, is altogether unconscious of any change. I frequently watched this operation, but on no occasion could I perceive the slightest shock, even when situated only one or two carriages from the end of the train.

"On one occasion, the banking-engine had got before us on the incline; as the hooking of it on in such a situation was a much severer test of the skill with which such matters are managed, I attended closely to the operation; we were going twenty-five miles an hour. The banking-engine gradually slackened its rate, and allowed the train to gain upon it, until it could be hooked on; that done, more steam was given and we proceeded with its assistance, yet not the slightest shock was felt in the train. These facts are sufficient to shew, that much greater rapidity is practicable, so far as the power of managing the apparatus is concerned. As to velocity itself, I made some observations. Twenty-five miles an hour is not so very rapid: over and again, I saw bees not merely keep pace with us but fly round and across the coach, and that not by help of any current of air which might be supposed generated, but at several feet distance from the train. At times, two specimens of the *Libellula grandis* kept up with us over half a mile; while the smaller birds, such as the linnets, were unable to cope with the steam. One I almost caught, which, while flying with all its might, remained opposite to the window for a few seconds. If a railway be regarded only as a means of communication between two distant towns, I should have no hesitation in saying that a rate even of one hundred miles per hour could be maintained with perfect safety to the passengers; but it is different if passengers have to be let out at stations along the line, for then the trouble and expense of stopping the trains come to be considered. An average of about three minutes is consumed by each stop, including the slackening and regaining of speed before and after stops."

NEW RAILWAY CARRIAGE.

Mr. Coles, of Charing Cross, has patented a railway carriage on a construction, which, by removing friction on the axle-trees of the wheels which come in contact with the rail, enables them to work with increased speed, and, consequently, to carry the body of the carriage at a rate infinitely beyond that at which the most rapid journeys on railways are now performed. As far as the invention can be tested in the miniature of a model, its results appear satisfactory, and of undeniable utility. The principle is somewhat like that by which a heavy weight can be raised with comparatively very trifling strength, by the multiplied power of pulleys, and by the revolution of a large wheel operating upon a smaller

wheel, and causing it to revolve in the proportion of sixty to one in its revolutions round its axis. The principle, by multiplying the wheels, might be carried almost beyond belief as to its effects on the rapid revolution of wheels, by the removal of friction or pressure upon the axles. When the machine is set in motion, the axle of the ground-wheel, instead of bearing on the nut or collar, works upwards against the rim of the large friction-wheel, on the axle of which the weight of the contents of the carriage is thrown; and the axle of the latter is met by the rim of the upper friction-wheel, which works upon a fixed steel axle screwed at the back of the frame, and which carries the whole weight of the frame, body, and passengers, and works once round its axle, whilst the ground-wheels revolve sixty times. The speed might be estimated at 100 miles an hour, without producing a heated axle-tree, the friction being removed. In the model exhibited at the Adelaide Gallery, a line is fastened, one end to the carriage, and the other to a six-ounce weight, the line passes over a pulley, and the weight propels the model, and a half-hundred weight placed on it, at a very rapid rate along a surface of iron. When only the common wheels are made use of in the model, it requires seven times its weight to move the model and its load.—*Abridged from the Times.*

NEW RAILWAY TRUCK.

THE annexed description of a new invention by Mr. Robert Grant, of Maine, (U. S.) is important to all connected with the construction and management of railways and locomotives, if it actually possesses the recommendations enumerated:—In the first place, the truck is guided by the car-body with such mathematical precision, that the wheels will, on a smooth plain, without rails or flanges to the wheels, trace any curve of not less than seventeen feet radius to the eighth of an inch. They require no more power of draught on a curve than on a straight line, and will entrely do away with all lateral action on the straight track, thereby dipsensing with one quarter of the force of traction in that case, and in passing a curve with one half. It is impossible to run them off the track after the locomotive has passed safely; they cost no more than other cars, will last as long again, and will not wear out the track more than one half as fast; they will be more easy, every way safer, and one quarter, if not one-third, of the expense of constructing and working railways, will be saved.—*New York Commercial Intelligencer;* quoted in the *Times.*

RAILWAY CONSTANTS.

AT the late meeting of the British Association, Dr. Lardner gave an account of some experiments undertaken at the desire and expense of the Society. He shewed an ingenious instrument contrived to register by itself the operations of the engine. It consisted of an upright cylinder covered with paper, which was made to revolve by a wheel acted on by a ratchet attached to a beam in the engine, reciprocating as the piston-rod; so that the cylinder revolved a definite space, say an inch, for a given space advanced by the engine on the road. The proportioning of these spaces admitted of alteration by lengthening or shortening the lever of the ratchet. An arm carrying a pencil traced the intensity of the pressure in the boiler at every instant on the revolving cylinder. This arm was erected on a piston sliding up and down a hollow cylinder, the steam acting against the under part of the piston, which was resisted by a

spring above. By one experiment with this instrument, it appeared that a descent of about 29 feet per mile brought the train, by the resistance of the air alone to an uniform velocity of twenty miles an hour; another of twenty feet to the mile did the same at five miles an hour; By some experiments of Mr. H. Woods, on the Liverpool and Manchester Railway, an incline of sixteen feet a mile gave the angle of repose; on an incline of 20½ feet per mile the air reduced the train to an uniform velocity of nine miles per hour; on an incline of twenty-one feet per mile, the uniform velocity was twelve miles an hour; on another of near 29.7 feet per mile, the uniform velocity was seventeen miles an hour. But, in neither of these nor Dr. Lardner's experiments was the quantity of exposed surface to the atmosphere, the weight of the train, or the state of the wind, mentioned. Until they are, of course, no data are furnished for calculation. M. Vignoles mentioned that an instrument was attached to the Dublin and Kingstown engines, which, among other things, marked the state of the roads as well as the quantity of friction. Dr. Lardner also described a dynamometer, by which the traction might be measured with considerable accuracy.—*Railway Magazine.*

USEFUL APPARATUS.

On November 24, was read to the Society of Arts, a communication from Mr. Thornthwaite, on a new apparatus for the use of divers, to enable them to fetch up articles with greater expedition, or execute with more facility any works below the surface of the water; and which had been used in the repairs of the gates at St. Katharine's Dock with great success. The principal advantage consisted in a volume of condensed air contained in a vessel, and regulated by a valve, so that the person employing it has immediate command over it. The silver medal was unanimously awarded for this invention. A description was next read of an apparatus by Mr. Bowles for raising empty casks, which consisted of a single catch introduced into the bung-hole (similar to the end of a dog-chain,) and the ingenuity of the invention was much admired. From Mr. Jones was exhibited a travelling platform for the purpose of descending ropes, applicable to the repairs of buildings where ladders could not be applied, in descending cliffs for practical or geological purposes, or repairing wells or shafts; and for which the silver Isis medal was awarded.—*Times.*

IMPROVED PEN-HOLDER AND INKSTAND.

The *revived* use of metal pens appears to have led to several elegant improvements in writing materials, in which our best mechanicians have manifested considerable ingenuity. Such improvements may, by hasty observers, be deemed too trifling to merit the distinction of "scientific;" but, it must be recollected, that not only are such novelties recommended by their near approach to perfection, but the means by which they are constructed strictly belong to the highest branches of mechanical science. To the above class of observers we would also say, with Johnson, "nothing is to be considered as a trifle by which the mind is inured to caution, foresight, and circumspection."

We have been led to these reflections by the inspection of a Penholder for metal or quill pens, improved by Mr. G. Riddle, during the past year. It will be remembered that Bramah's patent-jointed penholder was only adapted for pens of an elastic character, or of an uniform curve and thickness; the insertion of a large or thick pen causing a straining of the joint, which prevented its holding a thick pen ever

after. Various attempts had been made to simplify this holder, and preserve its good qualities, but without success; till Mr. Riddle constructed his "universal pen-holder," so named from its being adapted for every kind of pen. It consists of a gold or silver tube, with a handle; on the under side of the tube, which is semi-cylindrical for a short distance up, there is a detached limb held by a strong spring-joint, constantly tending to keep the jaws of the holder apart. This tendency is counteracted at pleasure by a sliding ring, which, being pushed towards the extremity of the holder, brings the jaws so closely together, as to hold fast the pen placed between them, without any trouble, and without inking the fingers: it is there held firmly, but can never become fixed, as on loosening or withdrawing the ring, the holder flies open, and the pen is instantly discharged. The joint, which, in other holders, has always been the weakest part, in the above is actually the strongest; and any variation in the size of the pen is provided for by a proportionate shifting of the fulcrum.

Mr. Riddle's second novelty consists of a travelling inkstand, with perfect security against the escape of ink, a large aperture for dipping, and great facility in opening and closing. It differs from its predecessors, in having a moveable washer, so balanced within the top, that, when screwed down, it infallibly seats itself upon the aperture. From the screw-part revolving independently of the washer, the surface of the leather is not abraded or destroyed, and the well-known defect of leakage is prevented.

Another improvement of the year is Mr. Riddle's introduction of a watch-key, or a patent seven-guarded key into his patent ever-pointed pencils, the seal-top of which forms the handle of the key; the usual reserve of leads being placed at the pencil-end of the case. The advantages are a ready means of securing the writing-desk, the jewel, cash, or deed-box, and of carrying the key concealed from observation, protected from accidents, and without incumbrance to the wearer.

THE THAMES TUNNEL.

It is gratifying to report this ingenious work to be hastening to completion.

In March last, the Directors reported, that, notwithstanding many unfavourable circumstances, during the year 1837-38, 136 feet had been added to the Tunnel; and of that number sixteen feet had been added within the previous seven weeks, being at the average of above two feet per week. On March 21, however, an irruption took place, though without injury; the sixty or seventy persons in the works retreating in an orderly manner by the safety platforms to the top of the shaft, the water gradually filling the Tunnel in about a quarter of an hour.

Mr. Walker's Report to the Treasury, presented in July, next recommended the substitution of good artificial soil to work through, and keeping the silth or sand back by driving two rows of close whole timber piles; by which means Mr. Walker considered the Tunnel might be completed, notwithstanding the late irruptions, and with comparatively little difficulty or risk. Mr. Walker, however, objected on the score of expense, to Mr. Brunel's proposal for making a shaft on the Middlesex bank of the river, and carrying on the work from that side.

Capital of the company expended, £180,000; amount of advances made by the Treasury to 2nd November, 1837, £83,900; total expenditure, £263,900. Estimate, by Mr. Walker, of cost for completing the

Tunnel, £150,000; and for the other works remaining to be done and purchased, £200,000: total sum required, exclusive of contingencies, £350,000.

The works have since proceeded, and the total progress during the past year, to December 31, has been above eighty feet towards the Middlesex shore, from which there then remained little more than a similar distance to reach; the average weekly progress being about three feet.

In a communication on the progress of the works at the Tunnel, made to the Institution of Civil Engineers, Mr. Brunel states that the excavators are much more inconvenienced by fire than water. Some of the gases which issue forth ignite very rapidly; and the Reports from Guy's Hospital state some of the men to have been so much injured by breathing them that but small hopes were entertained of their recovery. The explosions are frequent, and put out the candles of the workmen, but the largeness of the space prevents their being dangerous. These deleterious gases issue from the mud of the river, and enter from a crevice at the top. Chloride of lime has been used, but without success. Inhalation of the gas produces sickness and other disagreeable sensations.

INSTRUMENTS AND REMEDIES FOR DEAFNESS.

The alleviation of deafness has very properly occupied the attention of a portion of the scientific world during the past year. The British Association have appointed a Committee for considering and reporting on the instruments best adapted for assisting the hearing in cases of deafness, and they invite co-operation, by suggestions, or by the loan of instruments or apparatus in the explanation of special views. The sum of £25 has been granted to the Committee, whose Report will be submitted to the next meeting of the Association.

Mr. Curtis, the experienced surgeon to the Royal Dispensary for Diseases of the Ear, has constructed an Acoustic Table, at which a deaf person may hear a watch ticking at the side opposite to him, or a person seated thereat, and reading moderately loud. Mr. Curtis has also very successfully employed Creosote as a remedy for deafness caused by a deficiency of the cerumen,—as follows: oil of almonds, four parts; creosote, one part; mix, and insert a little into the meatus night and morning.

A new acoustic instrument will be found described at page 71 of the present volume.

THE GAUDIN LIGHT.

On October 19, there were exhibited before the French Academy of Sciences some experiments in a new method of illumination proposed by M. Gaudin, which is stated to be an improved modification of the splendid Drummond Light. While Drummond pours a stream of oxygen gas, through spirit of wine, upon unslaked lime, Gaudin employs a more ethereal kind of oxygen, which he conducts through burning essence of turpentine. The Drummond Light is 1,500 times stronger than that of burning gas; the Gaudin Light is, we are assured by the inventor, as strong as that of the sun, or 30,000 times stronger than gas, and, of course, ten times more so than the Drummond.*

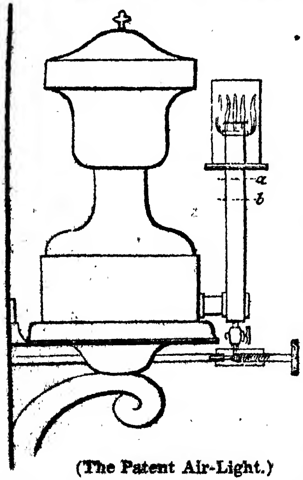
* It was during the Ordnance triangulation over Ireland, when months were passed on the mountain tops, vainly endeavouring to catch a glimpse of the distant stations, that Lieutenant Drummond ingeniously applied, rather than invented, the hydro-oxygen light which bears his name; and also con-

M. Gaudin states his Light to be of three degrees: the first is calculated to supplant the use of common gas, supplying a brighter and whiter light. The second, which is called "star-light," is brighter still, and proposed to be introduced into light-houses; a focus of the size of a nut giving out a blaze which it requires the protection of green spectacles to survey without injury. The third, which is called "sun-light," is stated to possess the dazzling brilliancy of that luminary. The Academicians are represented as being thrown into ecstasy by Gaudin's experimental results: but nothing in corroboration of the above startling statements, (abridged from the *Mechanic's Magazine*,) has yet appeared in England; save and except a claim of the priority of invention of such a light by Messrs. Keeene and Gurney.

THE PATENT AIR-LIGHT.

THIS important economic novelty, though patented as an improvement upon Mr. Beale's patent lamp of 1835, may justly be considered as a new invention. Its principle is the maintenance by the light itself of a regular supply of the vapour of various hydrocarbons, obtained from coal and mineral tar, resins, bitumens, coarse oils, &c.; and a due and perfect mixture of atmospheric air with such vapour in the burner; whence the popular name of "the Air-light." From this mixture a most brilliant light has been produced, by means of apparatus of the most simple and efficient description.

For the details of this invention the reader is referred to the diagrams accompanying the specification of the patentee. The annexed figure represents a lamp containing the volatile substance whence the vapour is obtained; and the means by which the supply of atmospheric air is conveyed to the burner, and being therein mixed with the vapour, is caused to burn at the orifice through jet-holes, similar to the common gas-burner. The burner of the new lamp is divided into two parts; into the lower part passes the fluid from the reservoir as high as is shewn in the cut by the letter *b*, and thence the vapour passes into the vacancy above. Up the centre of the burner, and through the fluid, passes a small air pipe to the height of *a*; and the vapour and the air being thenceforth mixed in the chamber or upper part of the burner, the mixture rises to the circle of small holes at which the jets are lighted. The air-pipe, it should be added, passes immediately beneath the bracket on which the lamp stands, and has a screw and cock to regulate the supply of air. This pipe, which is laid on as is a common gas pipe, leads from a reservoir called an aerometer, wherein the supply of air is collected.



(The Patent Air-Light.)

structed an instrument which he called the Heliostat, for obtaining a reflection from the sun's rays, by which means distances exceeding 100 miles have been observed.—*Quarterly Review.*

Such are the leading details of the invention. Its characteristic recommendations are stated by the proprietors as follows:—

1. The Air-light is adapted for universal use; it being equally suitable for the assembly-room, warehouse, shop, or factory; and it may be introduced into the drawing-room in every diversity of form, and elsewhere where superior lustre is requisite, or where gas or oil has hitherto been deemed desirable. It may be used in isolated situations; the apparatus being convenient in form, or capable of being placed in a complete state in every house or building without any external aid.

2. The cost to the consumer will be about half the price of gas.

3. It is superior in intensity to gas; it being an uniform fine white light from one end of the flame to the other; and the flame being short, (scarcely one inch in length,) the light is very compact, and consequently, better adapted to receive the assistance, for certain purposes, of reflectors. The power of light from a ten-hole burner equals that of 22½ wax candles.

4. It is perfectly safe: no explosion can, under any circumstances, take place: the pipes which pass through the houses and apartments are merely conductors of pure air: and the whole apparatus requires no care beyond that bestowed on an ordinary lamp.

5. It is not in the slightest degree prejudicial to health; since the combustion being complete, it produces neither smoke nor smell.

6. The expense of the apparatus is moderate; and in situations where gas fittings are already placed, the same pipes, &c. will be available for the purposes of this invention.

THE DAGUEROTYPE.

SUCH is the name of an invention which M. Arago has announced to the French Academy of Sciences as "one of the most important discoveries in the fine arts, that have been distinguished the present century; the author being M. Daguerre, the celebrated painter of 'the Diorama.'" *

In this invention, advantage is taken of the property of chlorate of silver changing colour by the mere contact of light; by which means M. Daguerre fixes upon prepared metal plates, the rays that are directed on the table of a *camera obscura*, and renders the optical tableau permanent. In this manner, an exact representation of objects, in light and shade, is obtained with the greatest accuracy, and with the beautiful soft effect of fine aquatint engraving. The invention is not wholly without its antecedent; as M. Arago states in his report: "it is impossible not to observe how many chemical products undergo remarkable modifications beneath the influence of light. There is even a gas capable of remaining for ever in darkness, without giving any sensible token of its presence, but which explodes immediately on the approach of a single ray of light. Other bodies, again, undergo modifications of colour."† M. Daguerre made this discovery

* The Daguerotype, being a chemical and optical discovery, belongs not strictly to the present section; which, however, presents the only means of submitting it to the reader as an invention of the past year; the report of its merits having been submitted to the French Academy so lately as Jan. 7, 1839.

† The blackening property of paper washed with a solution of *nitrate of silver* when exposed to the sun's rays, is an analogous effect. In a Manual of Novel Experiments and Phenomena, entitled *Parlour Magic*, and published during the past year, occurs the following example:—"*Light a Painter.*—

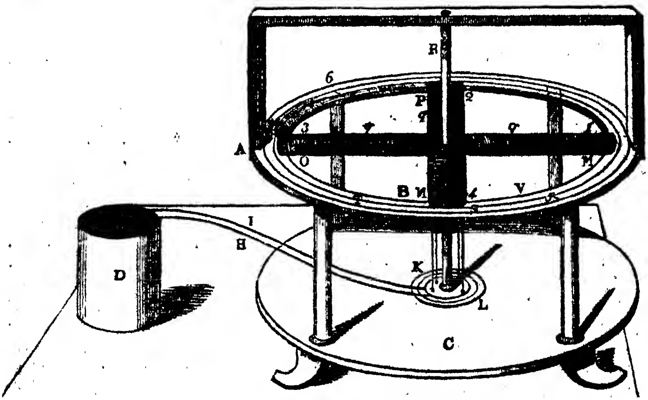
some years ago; but he did not then succeed in making the alterations of colour permanent on the chemical substances. This main desideratum he has now accomplished, with such precision that M. Biot compares M. Daguerre's invention to the retina of the eye, the object being represented on one and the other surfaces with almost equal accuracy.

The invention, it appears, will be chiefly applicable to architectural subjects, and its advantages to travellers are incalculable; since it will enable them, under the most perilous circumstances of position or temperature, to obtain a fac-simile of any desired scene or monument. M. Daguerre describes the process as very simple; and the machine is so far from cumbrous, that he stood upon the bridges of Paris to use it, without being particularly noticed by passers by.

From a paper read before the Royal Society on January 31, 1839, it seems that M. Daguerre's invention is almost identical with a discovery made nearly five years ago by Mr. H. F. Talbot, which he names "Photogenic Drawing." Mr. Talbot also refers to a prior attempt of this kind recorded in the *Journal of the Royal Institution*, for 1802, by which the idea appears to have been originally suggested by Mr. Wedgwood, and afterwards experimented on by Sir Humphry Davy; although Mr. Talbot adds that his experiments were begun without his being aware of these previous attempts. (*See Athenæum, Feb.*) For an analogous contribution to Science, by Mr. Talbot, *see page* 141 *of the present volume.*

DAVENPORT'S ELECTRO-MAGNETIC ENGINE.

THE following details of this machine for applying the power of magnetism and electro-magnetism to the propelling of machinery as a substitute for steam-engine, are extracted from the *Franklin Journal.*



(Davenport's Electro-magnetic Engine.)

Strain a piece of paper or linen upon a frame, and sponge it over with a solution of nitrate of silver in water; place it behind a painting upon glass, or a stained window-pane, and the light traversing the painting or figures, will produce a copy of it upon the prepared paper or linen, those parts in which the rays were least intercepted being the shadows of the picture."—Page 58, second edition.

The frame A A A may be made of a circular, or any other figure, divided into two, or more platforms, B and C; upon which the apparatus rests, and of a size and strength adapted for the purpose intended. The galvanic battery, D, is constructed by placing plates of copper and zinc, alternately, of any figure, in a vessel of diluted acid: there are two conductors, H and I, one from the copper, and one from zinc, in the vessel D, leading to, and in contact with copper-plates, K and L, placed upon the lower platform. These plates, or conductors, are made in the form of a segment of a circle, corresponding in number with the artificial magnets hereinafter described; they are placed around the shaft, detached from one another and from the shaft, having a conductor, leading from the copper-plate of the battery, to one of said plates on the lower platform, and another conductor leading from the zinc-plate of the battery, to the next plate on said lower platform, and so on alternately (if there be more than two plates on said lower platform) around the circle.

The galvanic magnets, M, N, O, P, are constructed of arms, or pieces, of soft iron, in the shape of a straight bar, horse-shoe, or any other figure, wound with copper wire *q*, first insulated with silk between the coils; these arms project on lines from the centre of a vertical shaft R, turning on a pivot, or point, in the lower platform; said copper wires *q*, *q*, extending from the arms parallel, or nearly so, with the shaft down to the copper-plates, K and L, and in contact with them. The galvanic magnets, are fixed on a horizontal wheel of wood V, attached to the shaft.

The artificial magnets S, T, are made of steel, and in the usual manner. They may be of any number, and degree of strength, and fixed on the upper platform, being segments of nearly the same circle as this platform; or if galvanic magnets are used, (which may be done,) they may be made in the form of a crescent, or horse-shoe, with their poles pointing to the shaft.

Having arranged these artificial magnets, on the top of the upper circular platform, there will be a corresponding number of magnetic poles—the north marked 5, and the south pole 6. Suppose the machine to be in a quiescent state; the galvanic magnet, No. 1, being opposite the south pole of the artificial magnets, the galvanic magnet, No. 3, will, of course, be opposite the south pole, No. 6, and the galvanic magnets, No. 2 and 4, will be opposite each other, between the poles just mentioned.

There being a corresponding number of copper plates, or conductors, placed below the artificial magnets around the shaft, but detached from it, as well as from each other, with wires leading from the galvanic magnets to these plates, and in contact with them, as before described, these wires will stand in the same position, in relation to the copper-plates, that the galvanic magnets stand to the artificial magnets, but in contact with the plates.

Now, in order to put the machine in motion, the galvanic magnet, No. 2, being charged by the galvanic current passing from the copper-plate of the battery, along the conductors and wires, becomes a north-pole, whilst, at the same time, the magnet, No. 4, is charged by the galvanic current, passing from the zinc-plate of the battery, and becomes a south pole; of course the south pole of the galvanic magnet, No. 6, will attract the north pole of the galvanic magnet, No. 2, and will move it a quarter of a circle; the south pole of the galvanic magnet, No. 4, being at the same time

attracted by the north pole, No. 5, causes the said magnet, No. 4, also, to perform a quarter of a circle: the momentum of the galvanic arms will carry them past the centres of the poles No. 5 and 6, at which time the several wires from the galvanic magnets will have changed their positions in relation to the copper-plates, or conductors:—For instance, the north pole, No. 2, having now become a south pole, by reason of its wires being brought in contact with the conductors of the zinc-plate, and No. 4 having, in like manner, become a north pole, its wire having changed its position from the zinc-plate to the copper-plate, the poles of the galvanic magnets are, of course, now repelled by the poles that before attracted them; and in this manner the operation is continued, producing a rotary motion in the shaft, which motion is conveyed to machinery, for the purpose of propelling the same.

Mr. Davenport has sent to this country a model of an Electro-magnetic Railway Locomotive, which is exhibiting at the Adelaide Gallery. This carriage runs on a circular railway, and draws after it two other carriages, which move, by the aid of two small galvanic batteries, at the rate of three miles an hour. The weight thus propelled is nearly 80lb., and the carriage containing the apparatus is about one foot square. The manner in which the electro-magnets are arranged, is kept a secret for the present; but the principle on which the application of the power depends is well known, and the chief superiority in Mr. Davenport's invention, consists in his having, by some peculiar contrivance, brought into exercise a greater amount of power within a given space and weight, than has been hitherto accomplished.

It is stated in the *Morning Herald*, whence the above details have been obtained, that the narrator had witnessed a two-horse power electro-magnetic engine, of Mr. Davenport's construction, satisfactorily employed in printing a newspaper in New York.

Mr. Francis Watkins has communicated to the *Philosophical Magazine*, No. 73, an interesting paper on Electro-magnetic Engines, with two forms of models of his construction, with reference to the American machine. Mr. Watkins considers there to be yet wanting an arrangement which shall *economically* employ this electro-magnetic power *on a sufficiently large scale* to be used successfully; adding, that the Emperor of Russia has placed at the disposal of M. Jacobi and scientific committee £500 for the purpose of making experiments for a new method of employing magnetism.

ELECTRIC TELEGRAPH FOR RAILWAYS.

The practical merit of the Electric Telegraph has already been tested on the London and Birmingham Railway, and the result has been successful. Four copper wires, acted upon at each end of the line at pleasure, by the agency of very simple galvanic communicators, have been laid down on the line of the railway, to the extent of twenty-five miles. They are inclosed in a strong covering of hemp, and each terminus is attached to a diagram, on which the twenty-four letters of the alphabet are engraved; in relative positions with which the wires communicate, by means of moveable keys, and indicate the terms of communication.—*Times.*

NEW DAY AND NIGHT TELEGRAPH.

MR. JOSEPH GARNETT has exhibited to the British Association a model of a new telegraph: to consist of two ladders, about forty-one feet long, framed together at about twenty-four inches asunder at the bottom, and twenty at the top, so as to constitute the frame for the machinery. There are two arms, one at the top, the other about midway up the frame-work, counterpoised by weights, and worked by machinery, consisting of eight bevel mitre wheels. At the bottom of the frame-work is a dial-plate, with a pointer, and the workman, in setting the pointer, brings the arm of the telegraph into the required corresponding position. The night signals are made by covering the lamps in a particular order. For instance, two vertical lamps, covered, designate twenty; two horizontal ones, covered, thirty, and so on.—*Athenæum.*

NEW HYDRAULIC TELEGRAPH.

THE model of a hydraulic telegraph, invented by Mr. Rowley, surgeon, R.N., of Chorlton-on-Medlock, has lately been exhibited. It consists of a number of lead pipes, of from a quarter to half an inch bore, each connected at one end with an air-receiver, inverted in water like a gasometer, and each having a separate stop-cock; the other end of each pipe being immersed in an eight-ounce white glass bottle, three-fourths full of water. The pressure on the air in the receiver, of course, propels a stream of air along any pipe of which the tap is turned so as to admit it; the effect of which is an instantaneous bubbling of the air at the extremity of the pipe as it escapes through the water in the bottle. The pipes in the model are about ten feet in length; but the inventor has experimented with a length of similar piping, extending (in coil) to the length of 400 feet; and by simply blowing in at one end of the pipe, the bubbling in the water was produced at the other almost instantaneously. The details of the adaptation of this principle to telegraphic purposes are, perhaps, scarcely yet matured; but the following are the main points. Six pipes so prepared are marked at each end in this way:—

*	A	B	C	D	E
	1	2	3	4	5

The one marked * is to be used as a preparatory signal, to call attention at the other terminus, and also as a stop between each word or signal. The permutations and combinations of the five letters, alone would form a tolerably copious stock of signals; but might easily be extended. The pipes would form the most considerable item of expense in such a telegraph. Lead piping of sufficient bore could be supplied at about £20 a ton, which would extend a mile in length. Thus, for the Liverpool and Manchester Railway, each pipe would cost about £600, or £3,600 for the six pipes, and the whole cost of such a telegraph for that distance would not be more than £10,000. The inventor has little doubt that a communication could be made to Liverpool, and an answer received in Manchester, in a few minutes, and quite as easily by night as by day.—*Abridged from the Manchester Times.*

ELECTRICAL TELEGRAPH.

PROFESSOR STEINHILL, of Munich, has made great progress in the invention of electrical telegraphs. His mode of forming the elements of telegraphic language is by the combinations, two by two, of small bells, of different tones, which are rung by the electrical apparatus. The Professor likewise records the communications in a permanent manner, by

the punctures of fine needles on a sheet of paper, moved by the same apparatus. In this way he can communicate about six words, without abbreviation, per minute, and scarcely any possibility of mistake; distance, we presume, being of little account in the transmission of intelligence by electricity. The liberality of the King of Bavaria has enabled the Professor to continue his interesting experiments on the railway between Nuremberg and Furth.—*Athenæum.*

MORSE'S ELECTRO-MAGNETIC TELEGRAPH.

WHILST the invention of the magnetic telegraph is disputed in several countries of Europe, Professor Morse, of the New York City University, has proved that he conceived and planned, five years ago, an electric telegraph, while on his passage home from France; and that immediately on his landing he commenced his machinery.

The distinguishing features of Professor Morse's telegraph are a *Register*, which permanently records in characters easily legible the fullest communication, and the use of but *one wire* as a conductor; although for greater convenience of communicating at all times, and of having a whole circuit at command from each extremity of the line, he will use four wires.

Professor Morse has experimented with a circuit of copper wire 1,700 feet in length, and of the minimum size of No. 18 wire. The record of the register was sufficiently perfect to demonstrate the practicability of the plan. Some slight changes were made in the machinery, when the register recorded perfectly the following signs:—

Successful experiment with Telegraph.
2 1 4 3 6 2 5 8

2 1 4 3 6 2 5 8
Successful experiment with Telegraph.

September 4th, 1837.
112 0 4 0 1837

1 1 2 0 4 0 1 8 3 7
September 4th, 1837.

The *words* in the diagram were the intelligence transmitted.

The *numbers* (in this instance arbitrary) are the numbers of the words in a Telegraphic Dictionary.

The *points* are the markings of the register, each point being marked every time the electric fluid passes.

The register marks but one kind of mark, to wit (V). This can be varied two ways. By intervals, thus (V VV VVV), signifying one, two, three, &c.; and by reversing, thus (Λ); examples of both these varieties are seen in the diagram.

The single numbers are separated by *short*, and the whole numbers by *long intervals*.

To illustrate by the diagram, the word "successful" is first found in the Dictionary, and its telegrapic number, 214, is set up in a species of type prepared for the purpose, and so of the other words. The types

then operate upon the machinery, and serve to regulate the times and intervals of the passages of electricity. Each passage of the fluid causes a pencil, at the extremity of the wire, to mark the points, as in the diagram.

To read the marks, count the points at the bottom of each line. It will be perceived that two points come first, separated by a *short* interval from the next point. Set 2 beneath it. Then comes one point likewise separated by a *short* interval. Set 1 beneath it. Then come four points. Set 4 beneath it. But the interval in this case is a *long* interval, consequently the three numbers comprise the whole number 214.

So proceed with the rest until the numbers are all set down. Then, by referring to the Telegraphic Dictionary, the words corresponding to the numbers are found, and the communication read. Thus it will be seen that by means of the changes upon *ten* characters, all words can be transmitted. But there are *two points* reversed in the lower line. These are the *eleventh* character, placed before a number to signify that it is to be read as a *number*, and not as the representative of a word.

Since the 4th of September, 1,000 feet more of wire, No. 23, have been added, making in all 2,700 feet—more than half a mile of a reduced size of wire. The register still recorded accurately.

In Thomson's *Annals of Philosophy*, vol. vii. p. 162, first series, February, 1816, is an article from the pen of Dr. John Redman Coxe, of Philadelphia, suggesting the employment of galvanism as a telegraph, which was then original. Those who are acquainted with the history of the progress of electricity, as evolved by the ordinary machine, are aware that experiments had been made with a view to its employment for a similar purpose, but from the inherent difficulties of the subject, the project had been abandoned.—*Silliman's Journal; Franklin Journal; Mechanics' Magazine.*

ACCURACY OF CHRONOMETERS.

SIR THOMAS BRISBANE having observed the surprising accuracy with which the difference of longitudes of London and Paris had been obtained by Mr. Dent's chronometers, he applied to that gentleman, who, with a liberality which did him the highest credit, placed at Sir Thomas Brisbane's disposal twelve of his valuable chronometers. With these, the differences of longitude of London, Edinburgh, and Mackerstoun, were taken; and by a mean of all the observations taken in going to the latter station and in returning, they were found to differ only by five one-hundredths of a second.

Sir John Herschel states that Kessels, of Altona, had tried this method, by taking his chronometers to Berlin and back again (as he believed), and the entire error was considerably within one-tenth of a second: when the paved and almost impassable roads of the Continent were taken into account, this was an astonishing degree of accuracy. Sir John said, that in a notice lately given by Mr. Dent, of a determination by himself and Major Sabine, of the difference of longitude of London and Paris, a statement was given of the error of the observations which was not quite fair; the truth was, Mr. Pond's assistant, in giving them the Greenwich time, had been inadvertently one second wrong; this error, of course, appeared in their result, but it was afterwards detected by the assistant himself, and corrected. This very fact, however, must be striking to the public, when an error of one single second was so readily detected, and became such a matter of debate among philosophers.—*Athenæum.*

IMPROVEMENTS IN THE MICROSCOPE. BY MR. THOMAS GILL.

THESE consist in producing the two *crossing motions* of the stage, and in regulating the light, in the following facile modes. My microscope has a square stem, with a rack and pinion, the latter having a milled head, two inches and three-quarters in diameter, in order to obtain readily *a tolerably accurate* adjustment of the *focus;* but the *minute adjustment* is effected by a fine screw, with a milled head, recently fitted to it by Mr. Andrew Ross, who has likewise furnished me with a new body, three of *his admirable achromatic compound objectives,* and three astronomical eye-pieces. The stage was originally mounted upon a bracket, proceeding from the upper sliding socket upon the stem, and had a *steady-pin* in addition to the screw, by which it was fixed to the socket, and expressly designed to prevent any side motion of the stage, as usual. I had only to remove the steady-pin, and thus obtained the *sideway movement* of the stage in a most effectual manner. Still the opposite motion, to or from the observer, was wanted. Mr. Ross had fitted to my stage his valuable *speculum* for *illuminating opaque objects sideways;* and for this purpose had mounted a pipe, or socket, to receive the stem of the carriage of the *speculum,* in a small plate of brass, which he fixed by screws to the underside of the stage, on the left side of it. This gave me the opportunity of employing another cylindrical metal stem, to fit his pipe, or socket, with a flat, circular head to it, nearly equal in thickness to the stage; and of cementing to it, with shell lac, a plate of glass, which lies upon the stage, and swings or turns upon that as a centre, and thus affords the *opposite crossing movement required.* I have, likewise, *graduated* the light from the plane or concave *specula* which slide upon the stem, thus:—a double convex *lens,* mounted in a screwed cell, was formerly slidden upon the stem upwards and downwards, to concentrate or diffuse the light from the *specula.* I have laid this aside as useless, and have fitted a short tube, with a diaphragm, or circular hole, at its upper end, a quarter of an inch in diameter, into a metal cone which used to be fixed upon the cell, under the stage, to lessen the light occasionally; and this cone, so altered, is now fixed to the screwed ring of the condensing *lens,* and can be slidden up and down on the stem, nearer to, or farther from, the plane or concave *speculum* and the stage, at pleasure; and thus graduate the light cast by them upon the objects. The length of the tube fixed within the cone is three-quarters of an inch; and the aperture in the cone below it is three-eighths of an inch; the diameter of the cone itself being an inch and a half; and the whole is blackened with a dull coat of varnish. Thus the passage of the light from the *specula* below to the stage is effected only through the short tube, and its upper and lower apertures; *the central rays only* being suffered to pass; an advantage I need not dwell upon.—*Magazine of Natural History.*

IRON SHIP.

ON October 18, the first iron ship built in Liverpool, was launched from the building yard of Messrs. Jackson, Gordon, and Co., and christened "The Ironsides." As a model, this ship is a beautiful thing: she has somewhat of the American build about her bows, has great breadth of beam, and a fine run. With the exception of her decks, she is entirely built of iron; she is 270 tons, old measurement, 24 ft. 6 in. breadth of beam, 13 ft. 10 in. depth of old, 96 feet keel, and has 99 ft. 9 in. for tonnage. When in the water, she floats like a cork, and her masts are stiff and steady.—*Liverpool Standard.*

LIFE-SHIPS.

THE plan of dividing the hull of a vessel into sections, each of which should be completely water-tight, has, it is believed, been long practised by the Chinese in their trade-barges; the several water-tight compartments being under lock and key, and appropriated to separate shippers. This mode of giving security has been successfully introduced into European naval architecture by Mr. Williams, the engineer of the Dublin Steam-boat Company. He divides the vessel into five compartments by means of four bulk-heads of iron, timber being objectionable from the impossibility of making it water-tight, as the planks would shrink from the heat of the vessel. The central section of this division is occupied by the engine boiler and coal bunkers, thus detaching them entirely from all other parts of the vessel. The sections, numbers 2 and 4, form the fore and after holds, or, in case of passengers' vessels, the fore and after cabins; and the two remaining sections, at the bow and stern, need not be as high as the main deck, as the water never could rise within several feet of the same. Here, then, is an effectual remedy against the casualties attendant on a vessel coming into collision with another. It may safely be said, that, unless the water break into the vessel in all its sections at the same time (which may be considered impossible), there can be no danger of submersion; and experience has proved that a small addition of buoyancy would prevent a vessel from sinking, after it had been so immersed that the deck was level with the surface of the sea.

The expense of these iron bulk-heads is not considerable, and their efficiency has been fully tested in a public experiment. Mr. Williams took a vessel, built under his superintendence, of the following dimensions:—Bow and stern sections, each sixteen feet long; the two next, thirty-five feet long each; and the centre, or engine section, fifty-eight feet; making the whole 160 feet. He caused the bottom of this vessel to be bored, and let the water flow freely into section 1, at the bow end. When so filled that the water remained at the same level outside and inside the section, it depressed the vessel six inches at the bow, raising the stern about two inches. Having the water pumped out, he then filled the next bow, section, 2. This depressed the bow twelve inches, without perceptibly raising the stern end. The vessel was then in the situation of one in which collision had taken place; and her buoyancy, in case of striking on a rock, or encountering another vessel when in full speed, was thus satisfactorily ascertained. But the protection which these iron bulk-heads afford against fire is equally important. The circumstance of any part of the vessel taking fire is followed by the same evil as that of the irruption of water, or collision; namely, its irresistible transmission, at once, through all parts of the vessel. Now, these iron bulk-heads being air-tight, they must stop the spread of flame, as they effectually prevent the introduction of any draft or current of air, so much to be dreaded in cases where the materials are combustible. Again, in extinguishing the fire in the section in which it originated, the crew would be enabled to work in comparative security. The fire being prevented spreading laterally, could only make progress upward towards the deck, and would be considerably retarded, if not altogether checked, by the absence of all currents of air from either end of the vessel. Indeed, it is questionable, whether the mere closing down of the hatches over the section would not at once extinguish it.—*New York Mirror.*

LAING'S IMPROVEMENTS IN SHIP-BUILDING.

MR. OLIVER LAING, of Woolwich, has presented to the British Association a model of part of a line-of-battle ship's bottom, shewing the method of attaching the keel, which may be dislodged by striking the ground, without danger to the ship; the base of the fabric being solid, substantial, and secure from water, even after the false keel, main-keel gripe, &c., are carried away. This system of building has been practised in the Navy, on men-of-war and steam-vessels, about twenty years, with great success; and several vessels thus fitted have been saved from shipwreck in consequence. Mr. Laing has also exhibited a method of securing a round-headed rudder; and a model of a tube scuttle for the admission of light and air between decks of ships, which has been adopted with great success.—*Athenæum; Literary Gazette.*

NAVIGATION OF THE DNIEPER.

WHILE iron railways are laid down in the north of Russia, measures are in progress in the south to make the Dnieper navigable. A canal, by which the first cataract in that river is avoided, has already been dug, under the direction of Lieutenant-Colonel Schypow, of the Engineers. The works are in progress for rendering eleven other cataracts in the Dnieper navigable, and it is expected they will be completed by August, 1839. Thus, there is a prospect of a very easy communication between the Baltic and the Euxine; and by means of the Don, between which and the Wolga a canal is begun, these two seas will have a communication with the Caspian. A company, established in 1837, for the navigation of the Dnieper, has a capital of 8,000,000 rubles, several steam-boats building, the engines for which are constructing in England.—*German Paper*, September.

MINING IN FRANCE.

MR. G. R. PORTER has presented to the British Association an elaborate statistical view of mining industry in France, shewing at what a rapid rate of increase the mineral resources of France have of late years been developed. The increase in the value of coal, iron, lead, antimony, copper, manganese, alum, and sulphate of iron, since 1832, has been forty-five per cent. There are forty-six coal-fields in France; and great as the increase has been of late years in the produce of the French coal-mines, large establishments are forming in the great field of the Loire, as well as in other localities; and it is expected that the opening of cheaper means of communication will give an impulse to coal-mining in quarters where it has hitherto been scarcely attempted. At present, France ranks second among nations in the production of iron; England being still immeasurably in advance of France. There are, in the latter country, twelve distinct localities, or districts, in which the making of iron is prosecuted: four-fifths of the fuel employed are wood; coke was not used in the iron-works of France until 1821, and, at the present time, is employed almost exclusively for processes subsequent to smelting the ore. The production in France of metals, other than iron, is of little or no commercial importance at the present time. The whole value of lead and silver, antimony, copper, and manganese, amounted, in 1836, to less than £60,000, and gave employment to only 1,760 workmen. Dr. Bowring considers this view of the mineral prosperity of France much too favourable; observing,—" Though the French engineers talked of the increased productiveness of their mines, they did not add, that iron in

France was from £5 to £7 per ton dearer than in England; and as 800,000 tons of iron are annually consumed in that country, it followed that the French were taxed to the amount of more than a million and a half annually."—*Literary Gazette;*

NEW MACHINE FOR RAISING WATER AND COALS.

Its chief agent is a pair of wheels; or, if necessary, a series, moving with their diameters in the direction of the weight to be raised,—say the shaft of a mine. Taking the one pair of wheels, moving on the same axis, we find that, from the end of a radius, or arm, in each, a chain descends, so as to hang on opposite sides of a square passage. To each chain are suspended, at different but regulated distances, quadrangular frames; to the upper sides of which strong projecting iron rims, moving on the principle of the hinge, are attached. The boxes, or receptacles for the weight to be raised, have corresponding edges on each side. When the wheel above is turned, and a single box below is placed in connexion with the lowest frame, it is caught by its rim, and, with one revolution of the wheel, is sent up as high as the frame on the opposite side to that on which it is borne; here it is again caught and sent up to the apparatus on the opposite side again, and so on, by alternate transmission, it is brought to the top of the shaft. The machine being kept constantly laden below, and its wheel constantly turned above, it follows, that, at each revolution of the wheel, a box is delivered; and thus, in an exceedingly short space of time, a vast body of matter can be carried up through any depth of shaft. The raising of water is performed by means of the same machinery; buckets with valves in the bottom being used instead of boxes.—*Mining Journal.*

ENDLESS LADDER.

Dr. Spurgin, of London, has patented this ingenious machine, for mining and many other purposes, where the main object is to raise or lower weights in constant succession. It consists of an endless ladder, made either of chain or rope, which passes over and under two revolving drums, or cylinders, mounted upon horizontal axes; one placed at the bottom, and the other at the top, of a shaft, or plain, to or from which the ladder is intended to reach. A continuous motion being given to either of the cylinders by the power of steam, or animal force, the endless ropes or chains, furnished with horizontal staves, like those of a common ladder, are made to circulate over the revolving cylinders; so that one part of this endless ladder is continually ascending with a slow but uniform motion from the lowermost of the cylinders to the uppermost, whilst, *vice versâ*, the other part of the ladder is descending to the lowermost. A vast deal of labour is thus unremittedly performed with great economy in time and power. The invention also provides a safe and easy conveyance for men; for which purpose, a small moveable step, or footboard, furnished with a hand-rail, is applied, which, if desired, can be made wide enough to admit of several persons standing a-breast, who are, by this means, passed up and down without fatigue, and in perfect security.—*Mining Journal.*

DESCENT AND ASCENT OF MINES.

At the sixth meeting of the Cornwall Polytechnic Society was exhibited the model of a plan for lowering and lifting persons by means of a counterbalance of water. It is well known that some of our largest steam-

engines lift 72,000,000 pounds a foot high, by the consumption of a bushel of coal; and it is found that to lift 100 men, each weighing 150 pounds, 200 fathoms, a quarter of a bushel will be sufficient. The cost of this will be two pence; and, if an additional penny be allowed for leakage, it will be possible, for *three pence*, to purchase a saving of human labour and human health, such as can hardly be conceived. The machine is, however, costly; but, by a liberal subscription which has been entered into by gentlemen connected with mining districts, it is hoped that shortly miners will be lifted out of mines by the above method.

WIRE ROPES IN MINES.

COUNT BREUNNER has recommended for deep mines and coal-pits the substitution of ropes made of twisted iron wire for the flat hempen ropes commonly in use. These iron ropes are of equal strength with a hempen rope of four times the weight: the diameter of the largest used in the deepest mines of Austria, is one inch and a half, the strength of which is little less than that of a solid iron bar of the same diameter. The usual weight lifted is 1,000 pounds; and, in one case, is a saving of about one-third of the power; for, four horses, with a wire rope, do the same work as six horses with a flat rope.—*Athenæum.*

EDUCATIONAL CIVIL ENGINEERING AND MINING.

A NEW class of civil engineering and mining has been opened in King's College, London, the admissions into which have been numerous. The course of education in this class is very comprehensive, and occupies the student several hours each day. It is adapted not only for young men who are intended for the civil engineer or miner's profession, but for all who are desirous of a scientific education.—*Times.*

The University of Durham has likewise set an excellent example in a course of education for civil engineers; which includes the pure and mixed mathematics, steam-engine and theory of heat, mineralogy, metallurgy and geology, the French, German, Spanish, and Italian languages.

PAVED AND MACADAMIZED ROADS.

MR. GORDON, in his work on *Locomotion*, states, that Blackfriars-bridge requires, for keeping it in proper repair, £1,000 per annum, when Macadamized; but it was kept in repair, as a paved road-way, for an annual average sum of £120.

REPAIR OF BLACKFRIARS-BRIDGE.

THE greater part of the repairs of the bridge is now completed. The works have been going on four years, and it is calculated that in about two years more they will be finished.

From the Report laid before the Common Council, in April, 1833, by Messrs. Walker and Burgess, the engineers who had been employed to survey the bridge, and who now conduct the works, it appeared that the structure was in a general state of dilapidation. This dangerous decay arose from the soft and friable nature of Portland stone, of which the bridge has been constructed. A general repair of the bridge from the foundation to the summit having been decided upon by the City authorities, the first great preliminary step of the engineers was to construct a coffer-dam, in succession, around each of the central piers. A coffer-dam is formed by driving two parallel rows of strong piles into the bed of the river, at a distance of from four to six feet apart; these rows, in the

of Blackfriars-bridge, are continued all round the dam; the space between the piles is cleared of gravel and sand by means of dredging apparatus, and then filled up with clay, which has previously been wrought to a soft and pliable state; this is continued up to three or four feet above high-water mark. The two rows of piles are connected together by large wrought-iron bolts passing completely through them; and the whole is steadied and supported by strong braces, which abut against the pier. The water is entirely pumped out of the space thus enclosed, and the workmen can then labour on the dry and solid ground. No idea of the strength and space of a coffer-dam can be formed until you go down into it. You will then be astonished to find that, as in the case of that now at Blackfriars-bridge, where the river is deep and strong, and the space to be enclosed extensive, the timber work looks like the skeleton of a man-of-war. Each coffer-dam at Blackfriars-bridge has taken about eight months in constructing; and as every dam occupies two arches, the City authorities would not allow more than one at a time to be driven, that the navigation of the river might not be impeded.

The foundations of six out of the eight piers have been protected from the action of the increased current consequent upon the removal of old London-bridge by a row of piles fourteen feet deep, which is continued all round the pier and connected to the caisson bottom (on which the piers were originally built) by strong bars of iron; the space between, as low as the caisson bottom, is filled with concrete, and the whole covered with a substantial pavement of Roche Portland.

The sides of the piers have been faced with granite from above high-water down to low-water mark; it having been deemed useless to remove the Portland below this level, as it now presents all the tool-marks as fresh as when first built.

The new stones are individually much larger than before. The pier now opposes a Gothic point to the current, instead of the late semicircular front; thus the water will have less effect on the work, and if a barge should strike against the pier, it will be pushed aside by the angle. At the foundation, the granite casing advances about a foot beyond the old work into the river, so that each arch will be about two feet narrower at the bottom; but the casing gradually narrows towards the surface, and at four feet above high-water mark it intersects the line of the arch. The stones of the cutwaters are dowelled together with stone cramps. The dowelling was formerly done with wood, most of which is found in a good state of preservation, yet adding but little strength to the work. There are forty men at work on each pier. There have been, at one period of the work, three piers at once in hand; but two of them being in shore, could be repaired during ebb tide without the circumvallation of a coffer-dam. It has been remarked that the interior of the old piers has been very carelessly filled up. When stripped, it looks more like compressed rubbish than a mass of solid masonry. Thirteen or fourteen months are the average time occupied in the repair of a pier enclosed in a dam. The breadth of each pier will be about twenty feet. Of the eight piers six are now completed; one is in hand, and two-thirds of the other are repaired.

The repairing of the arches has been a very tedious and laborious work. Every bad stone has had to be taken out and be replaced by a new one. The new stones in the arches are Portland, as well as the old. It has not been thought necessary to use granite here. When an old stone is removed from an arch, the space to be filled up is wider at the

back than at the front; hence arises the difficulty in repairing it efficiently. The broken or decayed part of the stone is generally cut out to the depth of about fifteen inches. After the old work has been properly prepared, the space is filled up with two stones, or thicknesses, instead of one. The one first laid, or the lower stone, is thicker at the back than at the front; the other stone will be thinner behind than in front. In the centre of the latter or upper stone a hole is bored, into which a cylinder-shaped stone plug is placed. To this plug a cord is attached, which passes through a hole drilled from the chamfer outside to the upper part of the large hole, where it is fastened to the top of the stone plug. By these means the plug is kept steady during the operation of driving. When the upper stone has been driven into its place, the cord is loosened, and the plug falls half its length into a hole in the lower stone, which has been made to receive it. When it is necessary to replace a stone high up in the arch (for instance, a part of the key course), as the plug which connects the two thicknesses lies horizontally, and cannot fall into its place, the workmen are obliged to bore a small hole from the chamfer to the back of the large hole in the thicker stone, through which they pass another cord, which is fastened to the other end of the plug. A small groove is made in the beds of stone to protect the string while the wedge-stone is driven home; which being done, it is only necessary to loosen one cord and pull the other, and the plug is immediately brought into hole in the other stone. By these means the two stones are so connected that it is impossible for one to come out without the other. To render the new fixtures more strongly embedded, soft mortar is forced through the hole so as to fill up the entire space around the plug, which it is then almost impossible to move. The difficulty of doing this work effectually may be further understood from the fact that the fixing of a double stone in this manner generally employs a mason and a labourer three days. The average number of double stones in each arch is eighty, except in the Surrey arch, where a fourth of the whole soffit has had to be replaced. As you pass under the arches now, the patchwork gives them a tesselated appearance, but the action of the weather will soon restore the identity of colour. In seven out of the nine arches, the repairs are now finished. The Ionic columns on the cutwaters of the piers will be renewed in Cragleith. The pavement will be eighteen inches lower in the centre of the bridge than before, and the approaches will be raised and made longer. The ascent will thus be rendered much more easy. This will be a great relief to cattle and pedestrians, particularly in wet weather.

The parapet will be plain and massive, instead of the open balustrades that hitherto lined the thorougfare. This part of the structure will thus, in the opinion of some, lose much of its beauty; but its strength, comfort, and safety, will be greatly increased. The new wall will be two feet lower than the old one. The stones composing it are of massive Cragleith, dowelled together with stone plugs. Some of the stones weigh three tons each, and they are generally nine feet long, forming a plinth next the water. This part of the bridge will be incomparably stronger than before; the old parapet was dowelled with iron and lead. There is, also, a great difference between the new and old cornices: the latter was formed of two thicknesses, each block being a distinct stone; but in the former the whole is composed of one stone, the block being worked out of the solid. The same kind of stone is used as that in the parapet and columns, viz., Cragleith, which

of Edinburgh. The footway will be of the same breath as before, and will be paved with Aberdeen granite.

The stone employed in the repairs is Aberdeen granite, Cornwall granite, Cragleith, and Portland stone. The stone is prepared at the contractor's wharf in Rotherhithe, and then conveyed to the works in barges. The number of labourers and mechanics altogether employed is about 250. The labourers are paid from 3*s.* to 3*s.* 6*d.* a day each. There have been five coffer-dams erected, or are in the course of erection. The piers and arches have not been repaired in succession ; but where a part was particularly damaged it received the earliest possible attention. The average quantity of timber in each coffer-dam is 30,000 cubic feet. The average quantity of granite in each pier will be 10,000 cubic feet. The expense of the repairs was stated, in the estimate, at £90,000, of which £30,000 were to be for the coffer-dams and the fundamental works. The bridge itself cost nearly £300,000. It was commenced in the year 1760, and occupied ten years in building. The whole length is 1,035 feet ; the breadth of the carriage-way is twenty-eight feet ; that of each footway seven feet. The inclination in the roadway is now as much in some parts as one foot in sixteen. The span of the central arch is 100 feet. The greatest height of the bridge is sixty-eight feet. Mr. Mylne was the architect.

It is calculated that, the present reparation being finished, the bridge will be three times as good as when it was built, and that it will not require repair for centuries to come, for granite is never known to moulder away.—*Abridged from the Observer, Sept.* 2.

REPAIR OF WESTMINSTER BRIDGE.

In consequence of the defective and dangerous state of the piers of this bridge, owing to their having been built in caissons, and lowered to the bed of the river without removing the stratum of gravel and sand, the current which has become very strong since the removal of old London bridge, is, by its constant action, undermining the whole structure. The engineer likewise neglected the precautionary measure of fixing sheet piling round the piers, except in the case of four ; the consequence is that all the remaining piers must now be surrounded with coffer-dams, for effectually ensuring the foundation. This will be done by driving sheet piling into the substratum, which is clay ; as well as by other measures. The works have been commenced under the direction of Messrs. Walker and Burgess ; Mr. Cubitt, of Gray's Inn-lane, being the contractor ; amount of tender, £87,000.—*Civil Eng. and Arch. Journal.*

MONTROSE SUSPENSION BRIDGE.

This stupendous structure is suspended by four main chains, which rest on massive stone towers, seventy-two feet high, thirty-nine and a half wide, twenty feet in thickness at the level of the roadway, and at the top thirty-two by twelve. The distance between the suspension towers is 432 feet ; and the bridge thus presented one vast and beautiful span over a deep and rapid river, unequalled in extent by any similar erection in Britain, except the Menai bridge. The entrance to the Montrose bridge, at either side, is by an archway in each tower, eighteen feet high by sixteen feet wide. The platform, or roadway, was laid upon cast-iron beams, suspended from the main chains by perpendicular iron bars, or tension rods, about five feet apart. On the occasion of a westerly gale, the bridge had been frequently observed in undulatory motion ; but on the afternoon of the 11th of October, it rocked like a vessel tossed in angry sea, and, at

the height of the storm, the platform separated nearly at the centre, and to the extent of about 130 feet, was almost instantaneously torn up by the hurricane, and disappeared in the waters beneath. The main chains stood firm; but nearly all the tension rods were twisted and bent from their position, and many broken; and, independent of the large portion of it carried away, the platform had, by the extraordinary vibration of the bridge, been detached six or seven inches from the stone-work at each end. The expense of the repair will not, however, exceed £500.—*Montrose Review.*

BRIDGE OVER THE DANUBE.

A NEW suspension bridge over the Danube, between Buda and Pest, will be begun early in 1839. It will be a colossal undertaking. Two piers of granite, and the red marble of Neudorf, thirty-five feet thick, and 150 feet above the level of the foundation, will support the whole structure. There will, consequently, be three openings for the water; the middle passage being 640 feet in width, and each of those at the sides 270 feet, making, in all, 1,180 feet. The entire length of the bridge will be 1,600 feet. Cast-iron beams will support the platform, which is to be thirty-seven feet wide, viz., twenty-five feet for the carriage-way, and six feet for each foot-path. The whole will be suspended by twelve chains, weighing together upwards of 2,000 tons.—*French Paper.*

FIRST BRIDGE OVER THE NILE.

THE works on this undertaking have at last commenced, and 24,000 men are now employed upon the bed of the river, the construction of dams, &c.; besides 340 carts and 500 carpenters from Alexandria. To provide for any deficiency of labourers, four regiments of infantry are encamped in the neighbourhood. This gigantic bridge will be erected on the south corner of the Delta, twenty-five miles from Cairo, just at the point where the Nile divides into two branches. It is intended to cut a sluice to keep up the waters in winter and spring, and canals are to be cut from the river to irrigate the land. A railway, eleven miles in length, has been commenced, to communicate between the stone quarries of Motratum and the bridge.—*Civil Eng. and Arch. Journal.*

THE SUSPENSION BRIDGE OF FREYBURG,

THE longest in the world, was completed and thrown open in 1834. The engineer who constructed it is M. Chaley, of Lyons. Its dimensions, compared with those of the Menai bridge, are as follows:—

	Length.	Elevation.	Breadth.
Freyburg	905 ft.	174 ft.	28 ft.
Menai	580	130	25

It is supported on four cables of iron wire, each containing 1,056 wires, the united strength of which is capable of supporting three times the weight which the bridge will ever be likely to bear, or three times the weight of two rows of wagons, extending entirely across it. The cables enter the ground on each side obliquely for a considerable distance, and are then carried down vertical shafts cut in the rock, and filled with masonry, through which they pass, being attached at the extremity to enormous blocks of stone. The materials of which it is composed are almost exclusively Swiss; the iron came from Berne, the limestone masonry from the quarries of the Jura, the woodwork from the forest of Freyburg; the workmen were, with the exception of one man, natives who had never

seen such a bridge before. It was completed in three years, at an expense of about 600,000f. (£25,000 sterling).—*Hand-book for Switzerland.*

SUSPENSION BRIDGES ACROSS THE AVON.

A SUSPENSION bridge has been constructed at Twerton, by Mr. T. Motley, the peculiar feature of which is, that each chain is attached to the roadway, and the suspending bars are carried up through each chain above it. The length of the bridge is 230 feet, the breadth fourteen feet; and the cost, including the towers and land abutments, under £2,400. This bridge is superior to the common suspension bridge, in that it is more firm, and experiences less friction, owing to the absence of vibration.

A suspension bridge of wire has been erected over the Avon, near Bath, by Mr. Dredge. This bridge is upwards of 230 feet in length, the breadth of the roadway is fourteen feet; and the whole, including land abutments, have been completed for less than £2,400.—*Proc. Brit. Assoc.* —*Athenæum.*

FLOATING BRIDGE.

ON March 13, a paper was read to the Institution of Civil Engineers, "On the Construction of the Floating Bridge across the Hamoaze, between Torpoint, in Cornwall, and Devonport," by Mr. James Rendel.

The width of the river, at the site of the bridge, is at high water 2,550 feet, and at low water 2,110 feet. The greatest depth at high water is ninety-six, and at low water seventy-eight feet. The current runs nearly at the rate of three knots an hour; though, during heavy land-floods and north-west winds, it increases up to five knots an hour. The site lies directly at right angles to the line of current, and is so much exposed, that ships frequently drag their moorings.

The bridge is a large flat-bottomed vessel, of width nearly equal to its length, divided, in the direction of its length, into three divisions,—the middle one being appropriated to the machinery, and each of the side ones to carriages and traffic of all kinds. These side divisions, or decks, are raised from two feet to two feet six inches above the line of floatation; and by means of strong and commodious draw-bridges hung at each end of the deck, carriages drive on and off, to and from the landing-places, without any difficulty. The bridge is guided by two chains, which, passing through it over two cast-iron wheels, are laid across the river, and fastened to the opposite shores. Two steam-engines are employed as the moving power, by turning a shaft, on each end of which there is a large cast-iron wheel whereon the guide-chains rest. The landing-places are simple inclined planes. To prevent the chains being so tight as to interrupt the free navigation of the estuary, or to endanger their breaking, instead of being fastened to the shores, their ends have heavy weights attached to them, in shafts of twenty feet deep and sixteen feet square, at the head of each landing-place, the weights being cast-iron boxes, loaded with five tons each. These weights rise and fall as the strain upon the chains becomes more or less, and prevents the tension ever exceeding the balance weights, which are considerably below the weight to which the chains have been proved. The length of the bridge, exclusive of the draw-bridges, is sixty-five feet, the width at midships forty-five feet, and at the ends thirty-eight feet six inches. The draught of water, when the bridge is heavily laden with traffic, is somewhat less than two feet six inches. The seat of the bridge in the water, or rather the lines of floatation, are elliptical, and the sides curved vertically; the object of these

the height of the storm, the platform separated nearly at the centre, and to the extent of about 130 feet, was almost instantaneously torn up by the hurricane, and disappeared in the waters beneath. The main chains stood firm; but nearly all the tension rods were twisted and bent from their position, and many broken; and, independent of the large portion of it carried away, the platform had, by the extraordinary vibration of the bridge, been detached six or seven inches from the stone-work at each end. The expense of the repair will not, however, exceed £500.—*Montrose Review.*

BRIDGE OVER THE DANUBE.

A NEW suspension bridge over the Danube, between Buda and Pest, will be begun early in 1839. It will be a colossal undertaking. Two piers of granite, and the red marble of Neudorf, thirty-five feet thick, and 150 feet above the level of the foundation, will support the whole structure. There will, consequently, be three openings for the water; the middle passage being 640 feet in width, and each of those at the sides 270 feet, making, in all, 1,180 feet. The entire length of the bridge will be 1,600 feet. Cast-iron beams will support the platform. which is to be thirty-seven feet wide, viz., twenty-five feet for the carriage-way, and six feet for each foot-path. The whole will be suspended by twelve chains, weighing together upwards of 2,000 tons.—*French Paper.*

FIRST BRIDGE OVER THE NILE.

THE works on this undertaking have at last commenced, and 24,000 men are now employed upon the bed of the river, the construction of dams, &c.; besides 340 carts and 500 carpenters from Alexandria. To provide for any deficiency of labourers, four regiments of infantry are encamped in the neighbourhood. This gigantic bridge will be erected on the south corner of the Delta, twenty-five miles from Cairo, just at the point where the Nile divides into two branches. It is intended to cut a sluice to keep up the waters in winter and spring, and canals are to be cut from the river to irrigate the land. A railway, eleven miles in length, has been commenced, to communicate between the stone quarries of Motratum and the bridge.—*Civil Eng. and Arch. Journal.*

THE SUSPENSION BRIDGE OF FREYBURG,

THE longest in the world, was completed and thrown open in 1834. The engineer who constructed it is M. Chaley, of Lyons. Its dimensions, compared with those of the Menai bridge, are as follows:—

	Length.	Elevation.	Breadth.
Freyburg	905 ft.	174 ft.	28 ft.
Menai	580	130	25

It is supported on four cables of iron wire, each containing 1,056 wires, the united strength of which is capable of supporting three times the weight which the bridge will ever be likely to bear, or three times the weight of two rows of wagons, extending entirely across it. The cables enter the ground on each side obliquely for a considerable distance, and are then carried down vertical shafts cut in the rock, and filled with masonry, through which they pass, being attached at the extremity to enormous blocks of stone. The materials of which it is composed are almost exclusively Swiss; the iron came from Berne, the limestone masonry from the quarries of the Jura, the woodwork from the forest of Freyburg; the workmen were, with the exception of one man, natives who had never

seen such a bridge before. It was completed in three years, at an expense of about 600,000f. (£25,000 sterling).—*Hand-book for Switzerland.*

SUSPENSION BRIDGES ACROSS THE AVON.

A SUSPENSION bridge has been constructed at Twerton, by Mr. T. Motley, the peculiar feature of which is, that each chain is attached to the roadway, and the suspending bars are carried up through each chain above it. The length of the bridge is 230 feet, the breadth fourteen feet; and the cost, including the towers and land abutments, under £2,400. This bridge is superior to the common suspension bridge, in that it is more firm, and experiences less friction, owing to the absence of vibration.

A suspension bridge of wire has been erected over the Avon, near Bath, by Mr. Dredge. This bridge is upwards of 230 feet in length, the breadth of the roadway is fourteen feet; and the whole, including land abutments, have been completed for less than £2,400.—*Proc. Brit. Assoc.—Athenæum.*

FLOATING BRIDGE.

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were concerned, the experiment was perfectly satisfactory, proving the superior tenacity of the cement, and shewing that an important improvement has been introduced at a very low rate of additional expense.—*Times; quoted in the Mechanics' Magazine.*

NEW CORDAGE.

THE brothers Landauer, of Stuttgard, have patented a new species of cordage, the threads of which are not twisted one over the other, but united in a parallel direction. A cord, one inch and three quarters in circumference, has sustained a weight of 1,300 pounds without breaking; and when, at last, an additional weight caused it to break, the fracture resembled a cut with scissors, which proves that each thread was of equal strength. A cord of 504 threads, three inches and three-sixteenths in circumference, 111 feet long, woven in this manner, only weighed nineteen pounds, whilst an ordinary cord of the same circumference and length, and as many threads, weighed fifty-one pounds and a half.—*Athenæum.*

NEW PROCESSES OF TANNING.

MR. F. CHAPLIN has patented the following new process. The hide is made into a bag by sewing the edges together, and then filled with the liquor, so that the pressure of the fluid, its own effort to escape, forces it through the pores of the hide; as it passes, the tannin is seized on by the gelatine, and the liquor comes out on the other side, having left the tannin behind it. In this way, the thickest hide will be perfectly tanned in about fourteen days, while it would require as many months on the old system. There have been many previous attempts to tan by pressure, but they have all proceeded on the supposition that very great and powerful pressure was required. Every one of these plans has failed, because, although the tanning was accomplished, the hides were rendered useless from the straining and distortion occasioned by the immense pressure. Besides, the apparatus required for each hide has been found too costly for practical purposes.—*Mechanics' Magazine.*

Another improvement has been submitted to the British Association by Mr. W. Herapath, and consists of pressure by roller; the author having assumed, that the great cause of obstruction to rapid tanning, is, that the weakened ooze is retained by the capillary attraction of the fibres and blood vessels so long, that, when it shall have passed out by exosmosis, it will have produced the same effect upon the soluble gelatine as is produced by maceration. The hides are formed into an endless band, which is passed between a pair of rollers fixed to each pit; so that, in succession, each hide may be raised from the bottom of the pit, squeezed by the rollers, and returned to the pit for a fresh supply of tanning liquor. Eight pairs of rollers require one horse-power to work them, and two boys, at 2*s.* 6*d.* a week each, to superintend them, when two bands, or 100 hides, will be taken off weekly.

RAPID MANUFACTURE.

MR. PASSEY, of 148, Moor-street, Birmingham, has in his possession a document, the material of which was rag, made into paper, dried, and printed, in the short space of five minutes; in the presence of seventy-eight persons, whose names are attached, and among whom are some of the first scientific men in the kingdom.—*Birmingham Advertiser.*

A bale of cotton was shipped on board the *Great Western*, at New York, on May 6th; arrived in King Road on the 22nd; was sent to the

new cotton factory at Bristol on the 23rd; and on the 24th, part of it, manufactured into yarn, was exhibited, at a public meeting of the inhabitants, as a specimen of the first cotton ever manufactured in that city.—*Mechanics' Magazine.*

LOFTIEST CHIMNEYS IN ENGLAND.

An immense chimney, attached to the new cotton factory, built for Messrs. Dixons, in Shaddongate, near Carlisle, has lately been completed. It is one of the highest buildings in England, being 305 feet from the ground; of octangular form, of brick, with stone angles. The base, which is built with fire bricks, is seventeen feet eight inches wide inside, and the foundation wall is ten feet thick. It tapers upwards to a width, inside, of six feet three inches; and on the outside, eight feet nine inches. Near the top is a cornice of stone, seven feet in depth, which projects three feet; and above this are eight feet three inches of brickwork, surmounted by a coping-stone one foot thick. The builder is Mr. Richard Wright, of Carlisle. The erection was carried on from the inside, stages being erected as the work proceeded, and the workmen and materials being taken up in boxes by a crab worked by four men. The whole structure resembles some splendid national monument.—*Carlisle Journal.*

The chimney recently erected at Mr. Muspratt's Chemical Works, at Newton, is stated to be the highest in England: it measures 132 yards 1 foot (397 feet) 4 inches.

MANUFACTURE OF IRON WITH GAS.

Mr. J. S. Dawes has communicated to the British Association a paper "On the Improvement of the Manufacture of Iron, by the use, as a Fuel, of Gas obtained from Water." Jets of steam are passed through red hot cast-iron pipes, filled with small coke or charcoal; decomposition immediately takes place; the base of the carbon of the coke combines with the oxygen base of the steam, forming, first, carbonic acid; but by passing this over a further portion of the red hot carbon, it is converted into carbonic oxide, sensible heat at the same time becoming latent on combining with the hydrogen base, producing hydrogen gas; which, together with the oxide before mentioned, is applied to the furnace by means of a jet inserted within the blast-pipe tuyere, the pressure upon the gas, of course, being equal to that upon the blast. An apparatus of this description has been in operation at Oldbury for several months, and the pipes are, apparently, little the worse for wear. The quantity of fuel required to keep them hot, is from twelve to fifteen hundred weight of small coal for twelve hours; and as the steam is obtained from the engine-boilers, the expense, with the exception of wear and tear, is comparatively trifling; so that the cost will not exceeed three or four shillings per 1,000 feet.—*Athenæum.*

GAS COKE AS FUEL FOR MELTING IRON.

Messrs. Merrick and Agnew, of the Franklin Works, Philadelphia, by experiments with gas coke, for melting iron, have arrived at the following important results. Their cupola is thirty inches in diameter. The blast is urged into it by a fan with four wings, having an aggregate area of 384 inches of fan surface moving 1,800 revolutions per minute through three tuyeres; two, four inches and a half in diameter, and one five inches; the aggregate area being fifty-one inches and a half.

The trial was made in two heats with each kind of fuel, and the results given are the aggregate of both heats respectively:

1st. *Anthracite Coal*, white ash of very excellent quality.

Time of blowing 1st heat	3 hrs.	15′	
2nd ...	3 ...	30	
Aggregate	6	45′	or 405 min.

Metal melted 15,464 lbs. or 2,300 lbs. per hour.
Fuel used 2,909 lbs. or 470 lbs. to ton of iron.

2nd. *Coke.*

Time of blowing 1st heat	1 hr.	54′	
2nd. ...	1	18′	
Aggregate	3	12′	or 192 min.

Metal melted 14,342 lbs. or 4,450 lbs. each hour.
Coke used 3,056 lbs. or 470 lbs. to ton of iron.

The weight of fuel used to each ton of iron melted, was in both cases precisely the same, but the quantity melted in the same time was nearly double.

The capacity of cupola for large castings is increased in proportion to the increased rapidity of melting.—*Abridged from the Franklin Journal.*

SILVER IN LEAD.

All the lead raised in England contains silver in quantities varying from one to one hundred ounces in the ton; but the chief proportion is from six to twelve ounces. Mr. Pattison has read to the British Association a paper on the means of extracting the silver, in which he observes, "When lead is heated red hot, it becomes transmitted into an oxide, whilst the silver retains its metallic quality." The oxide can be easily changed again into lead, but not without a loss, from its extreme volatility, of from a twelfth to a sixteenth of the lead refined. Mr. Pattison made various experiments to avoid this waste, and, in one of them, he ascertained, that lead was capable of being distilled for the purpose of coming at the residue of the silver; but the heat required to effect this process was so great, and must be so long continued, that the discovery could not be turned to profitable account. In another experiment, he stirred about the liquid lead until it cooled, forming a powder, at the bottom of which he discovered some crystals formed, on analysing which he found that they contained a lesser quantity of silver, leaving a greater quantity in the powder. Following up this hint, he formed large vessels, and by repeating the powdering process frequently, and removing the crystals, he brought the powder to contain silver to the amount of 200 to 300 ounces per ton, whilst the crystals did not retain more than from ten to fifteen dwts. per ton. This means is now in universal operation in the lead works of England and with the most profitable results. The expense of refining amounts to no more than three ounces in the ton, and the nett quantity of silver gained by this process is about 54,000 ounces per annum, besides about 300 tons of lead saved, in the same period, by avoiding the process of oxidation.

Mr. Pattison is of opinion, that the crystalization takes place by the homogeneous body of lead being drawn together by its own attraction, to the exclusion of the foreign body of silver; in the same manner as salt water becomes fresh in the process of freezing, the saline particles separating from it and dispersing in the aqueous fluid, whilst the fresh water all comes together in the form of ice. There is a difference between the solubility of lead and that of silver, but not sufficient to enable the metals to be separated by the fluidity of the one or the solidity of the other.—*Literary Gazette.*

ENORMOUS PLATES OF IRON.

Two plates of iron, said to be the largest ever made, have been manufactured by the Colebrook-dale Iron Company. They measure ten feet seven inches long, five feet one inch wide, seven-sixteenths of an inch thick, and weigh between seven and eight cwt. These were made for the bottom-plates of two steam-generators on Mr. Howard's plan.—*Liverpool Standard.*

NAIL-MAKING IN AMERICA.

It is within the memory of man that the first attempt to manufacture cut nails in New England was made in the southern part of Massachusetts, in the revolutionary war, with old iron hoops for the material, and a pair of shears for the machine. Since that period, besides supplying the consumption of the United States, estimated at from 80,000,000 to 100,000,000 pounds, and at a price not much exceeding the duty, machines of American invention, for the manufacture of nails, have been introduced into England; and immense quantities of nails have been exported from the United States to foreign countries during the past year.

BELL-FOUNDING.

A bell-founder has communicated to the *Athenæum*:—The English bell-founders have much improved their art within the last half century; and, in the theory of the shape (so necessary for the production of the musical intervals required in their scales of peals, &c.), have advanced very nearly to perfection. The most successful founders in this country have a diapason, which is very little known abroad. The composition of the metal is well understood. The secret of amalgamating silver with the other component parts is *not lost.* It is the opinion of many that tin is preferable *in every respect* to silver in the composition of bell metal; and that silver with copper is not so conducive to a good tone as pure tin with copper. There are some minor metals which are useful in purifying the usual admixture, such as arsenic; but arsenic wastes in very great proportion when subjected to the temperature required for our purpose. Raised surfaces, and engraved ornamental work on bells, have both been found obstructive to the evenness of the tones, and have, therefore, both been discarded as much as possible by our founders. I cannot but claim for the founders of this country the credit of producing the most perfect bells in every essential; of quality of tone, and power of tone; and I am certain that there can be no bells superior, if equal to them. I have heard Spanish bells, and German, and Flemish, and French bells, and I must declare that, as bell-founders, they are much behind us in all those countries. In America there are no bell-founders, or why do we export to them their church bells? I have at this moment two bells in my foundry, to replace two broken ones in a peal at Charleston, South Carolina; and it is but a short time since I replaced one for them at Christ Church, Philadelphia.

NEEDLE-MAKING MACHINERY.

At the late meeting of the British Association were exhibited several Specimens illustrating the Process of Manufacturing Needles by Patent Machinery, invented by Mr. S. Cocker, Porter Works, Sheffield. No. 1. Soft steel wire, in lengths, for two needles; 2. Ditto, pointed on conical files, making 10,000 revolutions per minute; 3. Ditto, grooved, with an indentation for the eye; 4. Ditto, ditto, and eyed; 5. Ditto, filed, headed,

and eyed, by punching; 6. Ditto filed, headed, drilled, and countersunk; 7. Needles made according to the old mode; 8. Finished needles (sharps) made by patent machinery; 9. Ditto (betweens), ditto. The value of labour from the wire, No. 1 to 7 inclusive, would be 1*s.* 1*d.* per thousand. The expense, by patent machinery, from No. 1 to 5 or 6 inclusive, 1*d.* per thousand. One hundred patent machines, which would occupy four rooms, each about twenty-five yards by ten, will, by the power of a six-horse steam-engine, be sufficient to produce 14,000,000 needles per week. The fash made in grooving is filed off by circular cutters, in the last operation of the machine, leaving the needle in the state of No. 5 or 6.

NEW THEATRICAL MACHINERY.

MR. MACDONALD STEPHENSON has produced a new and extensive series of designs for constructing, in our theatres, an entire system of machinery, by which the operations are rendered less complex, and the instantaneous effects produced are unlike anything heretofore seen on the stage of any theatre. Instead of having the stage, as at present, crowded with scene-shifters and others, they are scarcely upon the stage beyond half-an-hour during the evening's performance. The machinery will be constructed upon cast-iron columns, instead of being suspended from the roof; and the entire construction being of metal, is beyond the reach of accident by fire. The operations are performed by toothed wheels, at the ends of vertical or horizontal iron bars put into motion by a windlass at the back of the stage, which can be worked by one man. The wheels when put in gear, or when the teeth are made to act one upon the other, will work with extraordinary precision and ease; the drop-scenes are drawn up and let down from the top of the stage, and the side scenes are shifted without noise or confusion; the whole works quietly and evenly, and with a saving of 70 per cent.

Mr. Stephenson has received encouragement from the authorities of Paris, where the circumstance of the machinery being fire-proof has been considered almost as important as the other advantages which attach to its application.—*Abridged from the Morning Herald and Times.*

PENDULOUS PRINTING PRESS.

THIS instrument has been invented by Mr. Thomas Edmondson, for the purpose of dating the tickets given to passengers on the Newcastle and Carlisle Railway. Upwards of 10,000 tickets can be printed by it with one supply of ink. This is accomplished by means of a riband, saturated with a peculiar inking composition, attached to two small rollers, and shifted by the pressure of the finger against the instrument. The impression, which is dry and permanent, is obtained by simply putting the ticket into a space left for it in the centre of the press.—*Literary Gazette.*

FIRE-PROOF HOUSE.

MR. J. DAVIES has patented a composition, by covering walls, ceilings, partitions, staircases, &c., with which they can be rendered fire-proof, "a slight coating being sufficient to secure the wood-work from burning." Mr. Baddeley, in the *Mechanics' Magazine*, describes the composition as resembling "grey, or slate-coloured mortar; it is exceedingly pleasant to work, dries hard, is free from expansion, or contraction, under all variations of temperatures, and preserves its cohesive properties to the last. When dry, it is susceptible of as fine a polish as marble, and forms

a better ground for the reception of paint than any other substance I am acquainted with."

In June last, a house in Dorset-street, Clapham-road, having its timbers protected with this composition, was employed to test the efficacy of the invention. One of the rooms was furnished, and dry shavings were spread eighteen inches deep on the floor; these combustibles were set on fire, and were speedily consumed, the flames pouring from the windows and door, but not communicating to the adjoining apartment upon the same floor, nor to those above or below it; thus fully proving that fire can be confined to the apartment in which it originates, by means of this composition, which effectually prevents contagion. The other apartments of the house were then tested, by heaping shavings on the floor, which were fired, and more fuel added, until each of them might have been compared to the atmosphere of so many ovens; the result, in every case, proving equally successful. A similar experiment has been made at Manchester, with equal success.

FIRES OF LONDON.

Mr. Rawson has read to the British Association an interesting Report on these calamities, whence the following facts are extracted:—The total number of alarms of fire attended by the London Fire Engine Establishment, during the five years, from 1833 to the end of 1837, was 3,359, or 672 on the yearly average: of these, 343, or sixty-eight per annum, were false alarms, and 540, or 108 per annum, were fires in chimneys. Thus, the number of alarms was thirteen per week, and of actual fires four in every three days. Some of the false alarms had arisen from atmospheric phenomena, such as *Auroræ Boreales*. Of the 2,476 fires, the premises were wholly consumed in 145 instances; seriously damaged in 632; slightly damaged in 1,699. An analysis was given of the presumed causes of total destruction, and it was observed, that the number of fatal fires had greatly increased. The winter months do not exhibit so large a preponderance of fires as might be expected. December presents the largest average, but the next in order is May. The number of wilful fires in the five years was thirty-one, or six per annum, which is as one in sixty-four to the number of fires of which the causes were discovered.

Reference was made to the great excess of fires in the Southern counties of England over the Midland counties. This was attributed, by Sir Charles Lemon and Mr. Felkin, to the use of thatched roofs. It was also stated, that Newcastle, notwithstanding the vast consumption of coal in the town, is remarkably free from fires of dangerous magnitude: and it was suggested whether, as the greater number of fires occurred in London about eleven o'clock at night, the practice of raking out the fire at bed-time, which is not done at Newcastle where coals are cheap, might not have some connexion with these conflagrations.—*Athenæum.*

According to Mr. Baddeley's interesting *resumé*, in the *Mechanics' Magazine*, No. 757, the total number of fires in the metropolis, in the year 1837, was 501; alarms from fires in chimneys, 127; false alarms, 89; making the number of calls, 717.

FIRE-PROOF ZINC.

The objection to the use of zinc is its fusibility and inflammability: but it is affirmed that Baron Steinkeller, who carries on the manufacture to a great extent in the vicinity of London, has discovered a process by

which zinc is deprived of these obnoxious qualities to as great a degree as cast iron.—*Mechanics' Magazine.*

DE FONVIELLE'S NEW FILTER.

An important improvement in filtration has been lately invented by M. de Fonvielle, of Paris; the process has been examined by M.M. Arago, Gay-Lussac, Magendie, and Robiquet, who have reported thereon to the Academy of Sciences as follows:—

Filtration has not hitherto been attempted in France on a very large scale. In several valuable establishments in Paris, at which it is performed, a large number of small boxes, lined with lead, open at top, are provided, and contain at bottom a bed of charcoal between two layers of sand. These are, in fact, the old filters patented by Smith, Cochet, and Montfort. When the waters of the Seine and Marne arrive at Paris, very highly charged with silt, and undergo depuration in those boxes, it is found necessary to renew the strata, or, at least, the upper one, every day, and even twice a day.

Each superficial metre of filter gives about 3,000 litres (nearly 800 gallons) of clarified water every twenty-four hours: hence it would require seven square metres, or seven cubic boxes of one metre in the side, for every inch of fountain pipe; and 7,000 such boxes would be requisite for the service of a town, where the consumption would demand 1,000 inches.

There is a very simple method of increasing the product of these little boxes: it is, to close them hermetically, and to cause the water to pass through the filtering mass, not by its own weight merely, or by a simple charge, but by strong pressure.

The filter of Henry de Fonvielle, at the Hotel Dieu, though it has not one metre of superficial extent, yields daily, by a pressure of 88 centimetres (= 34.6 inches of mercurial pressure, = one atmosphere and one-sixth), 50,000 litres (=13,200 gallons), at least, of clarified water. This amount, deduced from an examination of the various services of the hospital, is a small part of what the apparatus might furnish if the feeding pump were constantly in operation. At certain times we found, in fact, by direct experiment, that the filter would yield as much as ninety-five litres (= twenty-four gallons) per minute. This would be nearly 137,000 litres in twenty-four hours, equal to about seven inches of pipe. But the quantity first named is seventeen times greater than by the methods commonly in use.

Since M. de Fonvielle presented his memoir, and especially since the results at the hospital, several persons, and among others M. Ducommun, have claimed the invention of filtering by increased pressure: but the rights of M. de Fonvielle appear to us to be incontestible. From the parliamentary inquiry, we learn, that engineers had not been unmindful of the possibility of effecting filtration under moderate pressure,—and that some had adopted this mode in a manner which involved them in hydraulic errors. In France we find everywhere, and especially at the beautiful mineral water establishment at Gros-Caillou, a fine disposable high pressure, entirely neglected. We see, in fact, M. Ducommun, whose name is so honourably known in this department of the arts, using, at the Hotel Dieu, three cisterns to clarify fifteen hectolitres in twenty-four hours; while a single one of these cisterns, modified by Fonvielle, yields, in the same time, agreeably to the report of M. Desportes, steward of the hospital, 900 hectolitres of water, perfectly filtered, in lieu of the fifteen.

But the employment of high pressure is practicable only in combination with another process, of which no one contests the invention with M. de Fonvielle.

We have seen in time of freshets, a filter of one square metre, requiring to be cleansed once, at least, in twenty-four hours, although it would clarify only 3,000 litres of water. It would seem, at the first view, that the filter of M. de Fonvielle, which clears seventeen times more, must require cleaning every hour. Such, however, is not at all the case. No more attention is requisite than in ordinary filters.

The explanation is simple enough when we remark, that, under a feeble pressure, a filter acts, as it were, only at its surface,—that the mud scarcely penetrates it; while, under great pressure, it may, or must, sink deeper. No one will deny that if more turbid water passes in a given time, there must be a proportionate deposition of feculent matter; but if this be found disseminated through a greater depth of sand, the permeability of the filter will not be more changed by it,—the cleaning merely will be more difficult: it is in this respect, above all others, that the new process is worthy of attention.

At Greenock, the engineer, R. Thom, cleans the mass of sand by a rapid counter-current, viz., from bottom to top. This mode may suffice when the filters are choked only at the surface; but the filters of M. de Fonvielle require more powerful means. This the author finds in the action of two counter-currents—in the shock, and sudden shaking and stirring which result from them. In cleaning the hermetically closed filters of the Hotel Dieu, the workmen, whose business it is, opens suddenly, and almost simultaneously, the cocks of the tubes which connect the bottom and top of the apparatus with the elevated reservoirs, or with the body of the feeding pump. The filter is thus tumultuously agitated by two cross currents, by which it is acted upon in a manner not very unlike that which a garment undergoes in the hands of a washerwoman. These currents have, in every case, the effect of detaching, from the filtrating gravel, the foreign matters which would otherwise remain adhering to it. We have no doubt of the great utility of these conflicting currents; for after having cleaned the filter of the Hotel Dieu, agreeably to the method of engineer Thom, *i. e.* by an ascending current, after assuring ourselves that this ascending current came out limpid,—as soon as the two other cocks were opened, the water rushed out from the filter in a very filthy condition.

The patients who witnessed the operation, expressed their great surprise at seeing, after an interval of a few seconds, the same fountain furnish, first a yellow mass as thick as soup, and then water as clear as crystal.

The process which you have charged us to give an account of, has received the sanction of time. For more than eight months it has been in operation at the Hotel Dieu; for more than eight months the same bed of sand, of at least a square metre in surface, has performed its functions without intermission; that there has been no occasion of renewing it; that the Seine, nevertheless, within this period has been extremely foul; and that, at the lowest estimation, twelve millions of litres of water (12,000 cubic metres) have passed through the apparatus. From these various circumstances we have deemed it unnecessary to make any trials of the further advantages which the author of the memoir expects to derive from a division of the thick filtering body now in use, into three beds, separated from each other; and in confining ourselves exclusively to what we have sufficiently examined, we do not hesitate to say, that, in shewing the possibility of clarifying large quantities of water with a very

small apparatus, M. Henry de Fonvielle has made an important advancement in the arts.

NEW GIMBLET.

On March 14 was exhibited to the Society of Arts for Scotland, by Sir John Robison, a new gimblet (French), not liable to burst the wood it passes through, and not requiring to be drawn out until the hole be completed. The gimblet was much admired; cuts clean, and makes a beautifully smooth circular hole. Sir John expected that similar gimblets would soon be manufactured in this country, as he had sent patterns to some of the English tool-makers.

PERCUSSION CANNON LOCKS.

The percussion principle has been adapted to the locks of great guns by Commander Henderson, R. N., by a method at once simple and effective. The apparatus consists of two square pieces of iron, a common fowling-piece nipple, and an iron cap to cover the nipple. The two pieces of iron are made just large enough to cover the groove about the touch-hole, and are connected with each other in the form of a hinge. One of these is fastened to the gun, by means of a screw, to the left of the touch-hole, and has the iron cap fastened to it in the same manner. The other piece of iron has the nipple screwed on to its centre, and, of course, communicates with the touch-hole of the gun when folded down. The gun being loaded, the cartridge pricked, and tube introduced, a common copper cap (such as is used for fowling-pieces) is put upon it; the iron cap is then brought over the copper one, when a tap with a wooden mallet never fails to ignite it, and discharge the gun. When fired, the plate of iron with the nipple is thrown back upon the other, thereby exposing the touch-hole, and giving room for the vent to be closed by the thumb in the usual manner. It is not the least of its advantages that the ship's armourer can fit the guns of a first-rate in this manner in a few days; and it does not interfere with the present equipment, as percussion, or other locks, may be used at the option of the commanding officer.—*Naval and Military Gazette; Mechanics' Magazine.*

TO POLISH GUN-STOCKS.

The new and easy recipe for polishing gun-stocks now (1838), is to varnish them precisely like the panels of a carriage. Nothing does better.—*Colonel Hawker.*

PLATINA WIRES FOR MUSICAL INSTRUMENTS.

A composer, named Fischer, proposes the substitution of platina wires for those of steel or brass. It is, he says, more elastic and ductile, and the sounds produced by this metal are sweeter; air and damp do not act upon it, and as it combines with iron, cords might be made of a composition of the two, which would present the advantages of each.—*Athenæum.*

SUBSTITUTE FOR EMERY.

Topaz continues to occur, in certain parts of the United States, in such abundance, that it is crushed to powder, and used as a substitute for emery. The hardness of the topaz is such (8) as to place it next to corundum (9), with the exception of spinella, automolite, and chrysoberyl, which approach nearer to corundum than topaz; but they have never

been found in such abundance as the latter at Monroe.—*Abridged from Silliman's Journal.*

RESPIRATION AND VENTILATION.

Dr. Reid has read to the British Association a notice "On the Quantity of Air required for Respiration." A difficulty existed in attempting accurate conclusions, from the diversity of constitutional temperaments, different states of humidity of the atmosphere, the state of insensible perspiration, and also from the admixture of small quantities of foreign gases; in one instance, the admixture of one five-thousandth part of sulphuretted hydrogen was enough to "knock up" a whole room, producing very serious effects. The degree of light was also an important element, ten per cent. of carbonic acid, producing much oppression in the dark; but, if strong light be admitted, it becomes tolerable. Dr. Reid stated, that, at St. Petersburgh, he was informed by Sir I. Wily, that cases of disease on the dark side of an extensive barrack, were in the proportion of three to one, to those on the side exposed to strong light, and this uniformly so for many years. Dr. Reid explained the mode he had adopted to ventilate the House of Commons, which he illustrated by diagrams, and demonstrated by the exhibition of a glazed model of the House. The current of fresh air could be introduced either from below or from above, diffused uniformly, and not by violent draughts, but, as it were, insensibly, and under exact control as to quantity; the lowest supply being 36,000 feet per minute. The air, when used for the purposes of respiration and combustion, was conveyed away in an opposite direction to that in which it had been introduced. Dr. Reid said, that he had taken no account of the products of the combustion by which the heat and light were produced, as these products should be omitted in all calculations on the subject. They, if possible, should be carried off so as not to interfere with the immediate supply to each individual. For the purpose of raising the temperature, hot water was used in iron tubes, not raised above 150°.—*Athenæum.*

WARMING AND VENTILATING.

Mr. Babbage observes, that great care is requisite in all experiments on the above subjects, especially with reference to the heat of smoke in the flues. He had once observed the smoke at two feet from the exit to be 190° Fahrenheit, the water in the hot-water apparatus being 260° Fahrenheit; the slightest change in one damper caused the temperature of the smoke in the flue to fall almost immediately to 160° Fahrenheit, and that of the water to rise to 290° Fahrenheit. Thus, by a slight alteration in the damper, about 60° Fahrenheit were saved.—*Proceedings of the British Association.*

ECONOMY OF HEAT.

A paper has been read to the British Association, by Mr. G. W. Hall, "On the Power of Economising and Regulating Heat for Domestic Purposes."

The backs of the fire-places must be vertical, and the apertures of the chimneys as contracted as possible. One principle, in close fire-places, is that the burning fuel be surrounded by a substance retentive of heat, and capable of radiating it back upon the fire itself. This is attained by covering the fire itself with a species of fire-brick, and only allowing a very small aperture for the escape of the heat thus forced off at the highes

degree attainable, then to be economised by close confinement and regulation. The economy of heat, when attained, consists in conducting the hot air through long and horizontal flues, so as to counteract, as much as possible, its tendency to ascend, which tendency is exactly proportional to the temperature. These principles are equally applicable to cottage fire-places and extensive ranges for cooking.

HOT-AIR STOVES.

Dr. Ure is altogether opposed to the introduction of this "improvement" into close rooms; observing, "whatever mode of heating be adopted with a view to economy, in lofty public buildings, where there is abundance of air, we should never suffer our domestic apartments to be warmed by a stove, to the suppression of our open fires; which, when well constructed, upon the Rumford plan of rarefaction, give the most comfortable quality of warmth, with complete change of atmosphere."

LIGHTING AND VENTILATING THE HOUSE OF COMMONS.

On the evening of January 5, the House of Commons was experimentally lit with gas, upon a plan proposed by Dr. Reid. To understand the effect of the experiment, it is necessary to state that there are two ceilings to the House—the original flat lath and plaster one connected with the roof, and an additional one, placed some few feet below it, which was introduced when several alterations were made, with a view to improve the ventilation of the House, and to assist the hearing. This second ceiling consists of a wooden frame-work, in three divisions, running lengthwise, forming, as it were, three sides of an octagon; the two compartments next to the walls are glazed with ground glass, and equal the whole length of the building, being aslant, and supporting the third division, which is flat wainscot. Within the glazed ceiling were laid three lines of tubes upon an inclined plane. Immediately above the glazed divisions, behind the row of panes of glass, in the wall over the door opening into the reporters' gallery, was placed a single tube. There were no tubes at the other end of the house. The main cocks, which are all on the Abbey side, were turned, and three lines of strong illumination shot down on the floor from the roof, and one line from the reporters' gallery. In the former, the flames issued in oval jets, about an inch in length, and a quarter of an inch asunder, not less than 1,500 in a row, and incessantly flickering. From the single tube at the reporters' gallery, each flame issued in a triple jet. The view had a dazzling effect from the floor; and the light, without being in the least distressing to those who stood beneath, enabled one to read the smallest print with ease. No smell whatever was perceptible, the carbon not being permitted to come below the glass.

The object of the proposed use of gas was to discontinue the burning of wax-candles in the chandeliers; and thus, by saving a quantity of air, hitherto carbonified for the respiration of persons within the area, to give greater efficacy to Dr. Reid's plan of ventilation. To promote this plan, the number of holes in the floor had been doubled, through which the air ascended very densely when the carpet was off the floor; it rushed in at the doors with the force of a gale. The expense of gas was calculated at nearly £30 a-night, that of candles at not more than £5. The gas is stated to have burned, in the chambers above the ceiling, at a temperature of 130°. It has not been adopted, on account of its great cost.—*Abridged from the Times.*

VENTILATION OF THE BANK OF ENGLAND.

MR. OLDHAM has described to the Institution of Civil Engineers his method of ventilation, which is by means of a stove of a large surface, and a pump capable of delivering fifty cubic feet of air at a stroke. The foul air is let out at the top, and the intermitted air is of the temperature of 180°.

ECONOMY OF GAS.

A FLAME, consuming one-fifth of a cubic foot of gas per hour, will burn in a chamber, and not be liable to be extinguished by the opening and shutting of doors; and, if due precaution be used, a flame may be preserved with a consumption only of one-eighth, or one-tenth, of a foot per hour.—*Mr. Liddell; Proceedings of the British Association.*

GLEGG'S DRY GAS METER.

THIS instrument consists of a pulse-glass, that is, two thin globes united by a tube. These globes are partially filled with alcohol, and hermetically sealed when all the air is expelled from their interior. In this state, the application of a very slight degree of heat to one of the globes will cause the alcohol to rise into the other. The pulse-glass is fixed upon an axis, having a balance-weight projecting from it, and the axis works in bearings on the sides of a chamber, through which the gas to be measured is made to pass in two currents, one of which is heated and the other cold. The hot gas is made to enter opposite to, and to blow upon, the lower globe of the pulse-glass, while the cold gas blows upon the other. The difference of temperature by this means established between the globes causes the alcohol to rise into the upper one, and the glass turns over on its axis, thus varying its position, and bringing the full globe opposite to the hot stream of gas. This stream, with the assistance of the cold gas, which condenses the vapour in the top globe, repeats the operation; and the speed at which the globes oscillate will be precisely in proportion to the quantity of gas which has been blown upon them, provided an uniform difference of temperature is always maintained between the two streams of gas. The difference of temperature is established and rendered uniform by a small flame of gas, which heats a chamber through which the lower current of gas has to pass; and the arrangement for securing an equality of temperature is very ingenious. The instrument is first tested by making a given quantity of gas pass through it, and observing the number of oscillations of the pulse-glass,which, being established, it registers accurately.

APPLICATION OF STEAM TO THE STOCKING-FRAME.

SEVERAL patents have been obtained by Nottingham people, for power stocking-frames. The advantages of a new plan lately invented, are, rendering the labour of working a frame much easier and pleasanter so long as applied to hand labour; and, if attached to steam-power, the attainment of a speed greater than any other invention has been yet able to gain. The expense of putting to power being small, and the wear and tear less than by hand, the saving of labour would be very considerable; twenty narrow frames, requiring only one man and one boy to watch, and producing twenty pairs of stockings per hour, or one hundred dozen per week.—*Leicester Chronicle; quoted in the Times.*

THE QUEEN'S CORONATION ROBES.

THE contract for the manufacture of Her Majesty's robes, as well as for 650 yards of silk, for the hanging and decoration of Westminster Abbey, was executed by Messrs. Howe and Coe, two of the most ingenious operatives in the silk trade. The robe, which is a very superb piece of manufacture, is ten yards in length, and of the same pattern as that worn by George the Fourth at his coronation; Mr. Howe being the artist who manufactured the robe on that occasion also, and who possesses the cones and patterns then used. The ground, or warp, is of rich gold-coloured silk, and the shoot consists of gold and silver twists, and silk of various shades. Some idea may be formed of the variety, from twenty different shuttles being in work at the same time. The principal surface resembles massive gold; and the figures, which are boldly raised, are of the most magnificent description. Those of the royal crown, the rose, the shamrock, and the thistle, are truly beautiful. The eagle, the *fleur-de-lis*, and other foreign national emblems, are also very prominent.

MOUSSELINE-DE-LAINE MANUFACTURE.

THIS appears to be a new species of fabric, which is likely to become very valuable. The *Glasgow Constitutional* states:—"The mousseline-de-laine was first introduced into this country about three years ago, is a fabric composed wholly of wool, within the reach only of the wealthier classes. To meet, however, the pretensions of all ranks in society, a mixed fabric, consisting of cotton and wool, was substituted, coarser wools being employed; and the trade having got into a great number of hands, the mousseline-de-laine may now adorn the person of any one who can command the price of a common chintz. Formerly, immense quantities were imported from France, on payment of a heavy duty, and, when first introduced, sold at most extravagant prices; but now the foreign goods have been met with such active opposition from the British manufacturer, that they are nearly altogether driven out of the market. This trade has given a mighty impulse to the wool trade; but, at the same time, it has considerably weakened the hands of the cotton-spinners, who are complaining of the small demand for particular sorts of their yarns. Besides other important attributes, they possess one intrinsic advantage—they do not at all ignite on coming in contact with flame, like muslins or calicoes."—*Times.*

THE NEW GREAT SEAL.

THE following is a short description of the seal, which has been executed by Mr. Benjamin Wyon, chief engraver of Her Majesty's Mint and Seals, in his usual style of excellence.—Obverse: An equestrian figure of Her Majesty, attended by a page. The queen is supposed to be riding in state; over a riding habit she is attired in a large robe, or cloak, and the collar of the order of the Garter; in her right hand she carries a sceptre, and on her head is placed a royal tiara or diadem. The attendant page, with his hat in his hand, looks up to the queen, whilst gently restraining the impatient courser, which is richly caparisoned with plumes and trappings. The inscription, "Victoria, Dei Gratia Britanniarum Regina, Fidei Defensor," is engraved in Gothic letters, and the spaces between the words are filled with heraldic roses.—Reverse: The queen, royally robed and crowned, holding in her right hand the sceptre, and in her left the orb, is seated upon the throne, beneath a rich Gothic canopy; on

either side is a figure of Justice and Religion ; and in the exergue are the royal arms and crown ; the whole encircled by a wreath, or border, of oak and roses.—*London Journal.*

GLASS CLOTH.

Mr. R. Baker, of Osset, near Dewesbury, has manufactured a web of glass cloth, which has a very splendid appearance; and he has so far succeeded in annealing this very brittle substance as to admit of its being woven like cloth. A specimen is deposited with the North of England Society of Arts, together with a slipper made of the same material.—*Liverpool Standard.*

LOGWOOD DYES.

A process has been discovered in France, by which the whole of the colouring matter contained in Campeachyan wood may be extracted and purified. This wood enters into the composition of many colours, and is consumed for this purpose to a very great extent.

ENGRAVING BY MACHINERY.

Mr. Bate's medal engraving by machinery has lately been applied, with success, to engraving in relief; and the medallion head of the queen, in that successful specimen of typography, the *Golden Sun*, was executed by Mr. Freebairn with Mr. Bate's apparatus. That the relief must be good is evidenced by the immense number which has been issued of that publication.

In steel engraving, by the machine, two beautiful works have been published, one the bas-relief design from a salver, by the celebrated Jean Gougou, and the other a head of the Duke of Wellington. The design is divided into several compartments, containing groups of figures, emblematical of the four quarters of the globe, their principal conquerors, and the four seasons ; the intermediate spaces being filled up with exquisitely finished ornaments of the style which prevailed in the sixteenth century, the era in which Jean Gougou flourished. Mr. Freebairn's engraving is the most clear, distinct, and brilliant representation of this rare work imaginable ; the effect of the relief is beautifully deceptive, and is heightened by the metallic colour of the ink in which the engraving is printed; the most minute details are given with perfect accuracy, and the drawing, both of the figures and ornaments, is preserved with a fidelity that reflects the highest credit on the skill of the artist, and accurate working of the machine.—*Mechanics' Magazine.*

STEREOTYPE ENGRAVINGS AND ILLUMINATED PRINTING.

Mr. Babbage has explained to the British Association certain new processes of engraving on copper and wood, and of taking impressions from hollow and raised plates or blocks. He shewed, by models and diagrams, that the great difficulty in wood engraving, or the raised die, was to obtain black lines crossing each other; and, in copper-plate, to obtain white lines crossing each other. He then mentioned a process, by which the former difficulty had been surmounted : a polished brass plate was thinly covered with plaster, on which surface the process of sunk engravings could, of course, be easily performed, and then, by taking a cast, the raised engraving might be obtained.

Mr. Babbage also referred to an improved process and apparatus for Printing in Colours from wood blocks, which have recently been patented

by Mr. Charles Knight. Of this beautiful improvement specimens have since been published, which, for transparency of tint and general artistical execution, must be universally admired; whilst, by their economy of cost, they promise to extend a better acquaintance with the true principles of the pictorial art amongst all classes of the people.

MODELS.

AMONG the donations recently presented to the Geological Society, is a beautiful model, in relief, of the city and environs of Frankfort on the Maine, and part of the Taunus Mountains, on the horizontal scale of one-thirty-thousandth, or about two inches to a statute mile, and on the vertical scale of one-five-thousandth ; it is executed, and liberally presented to the Society, by M. Ravenstein, of Frankfort, who proposes to model the whole of the *Rheinlande*, from Mainz to Bonn, on the same scale; including portions of the valleys of the Maine, the Lahn, and the Sieg, which will cover a space of about twelve feet square.

RESPIRATION APPARATUS.

DR. DALZIEL has brought before the British Association a model of an apparatus for the purpose of promoting respiration during sleep. Its object is to diminish the amount of atmospheric pressure on the surface of the body, while the patient is respiring atmospheric air of the usual density; and this principle may be applied in various diseased states with benefit, and particularly to the recovery of individuals labouring under suspended animation.

COOKING BY GAS.

SIR JOHN ROBISON has explained to the British Association a method of generating heat by burning gas through a tube of about six inches diameter, open at the lower end, the top end being covered by a wire-gauze, similar to the Davy safety-lamp. This process he had used in his own house for upwards of eleven years, and had found it completely successful; he introduced it as a substitute for coal. The wire-gauze is liable to be destroyed under a long-continued intense heat; but this may be obviated by sprinkling a small quantity of sand upon it. In a discussion which followed, Mr. Russell observed, that for cooking small joints the application of gas was most economical; but for cooking large joints the direct application of coal fuel was found the cheapest.—*Athenæum and Literary Gazette.*

IMPROVED BOTTLE-JACK.

MR. DANIEL, the inventor, has received a prize from the Cornwall Polytechnic Society, for an improvement, which is thus described in the Report:—" In outward appearance this instrument is similar to the common spring-jack. Its novelty consists in using the weight of the meat to be roasted, as the source of power for turning it. This is accomplished by an escapement formed by cutting a V-shaped groove down the side of a cylinder, which turns on a vertical pivot, and allowing the teeth of a wheel on an horizontal axis to play into this groove. The groove forms a double inclined plane down the side of the cylinder, the top and bottom extremities of which fall in the same vertical line; and the teeth of the wheel are placed at such a distance asunder, that one tooth escapes the bottom of the groove, at the same time that the next comes in contact with the top; this, of course, gives an oscillating motion to the axis of the

cylinder, which is made to communicate the requisite movement to the meat, through the medium of a toothed arc and pinion. The jack will run forty minutes, in which time the meat descends three inches, and by its descent gives motion to the toothed wheel already described. Mr. Daniel considers the lowering of the meat an advantage, inasmuch as it tends to dress both ends, without trouble to the cook."

BEET-ROOT SUGAR.

THE cultivation of beet-root, and the manufacture of sugar from it, are making rapid progress in Bohemia. Although the population scarcely amounts to 3,300,000 souls, there are eighty-seven manufactories in full work, and many more ready to commence. The soil and climate are said to be peculiarly favourable to the growth of this valuable plant.

At a late meeting of the Agricultural Society of Valenciennes, there were exhibited two beet-roots, grown by M. Moreau, at St. Saulve, each of which weighed twenty-eight pounds, and it was stated that his land had produced some even still heavier.—*Times, Oct.* 18.

It appears that in France more than 100,000,000 francs are invested in nearly 600 beet-root sugar manufactories; and Louis Philippe has declared, that he by no means despairs of soon seeing persons in France make their own sugar, as in England people brew their own beer.

NOVEL TRAVELLING CARRIAGE.

A CARRIAGE has been built for George Newman, Esq., of Kensington, which, for completeness, equals Sir Samuel Morland's celebrated cooking carriage of the seventeenth century. It is divided into two apartments, an ante-room and a drawing-room, or bed-chamber, with every comfort. The anteroom contains a table, drawers, and culinary utensils; the drawing room is furnished with sofas, sofa-bedstead, six chairs, table, cupboards, and a chandelier for nine lights; a stove and fuel. The length of the carriage is twenty-five feet, and the breadth nine feet; and the length of the drawing-room, twenty feet. The whole weighs two tons and a half.

IMPROVED COACH LAMPS.

MESSRS. KAY and JOHNSTON, Edinburgh, have produced a splendid lamp, for the use of Her Majesty's mails. The form is circular, with a rather small reflector behind; a funnel and air-holes are attached for draught, which force and carry off smoke so rapidly, that dimming or dirtying the glass and plates within—the great defect of the old lamps—are very little, if at all, known. The front of the lamp is grooved, and the adjoining metallic plates so shaped, that they become, in common with the reflector behind, foci of the purest lambent light.

SPEAKING AND CHECK-STRING FOR CARRIAGES.

M. CHARRIERE, surgical instrument-maker, of Paris, has, by an ingenious contrivance, converted the check-string of a carriage into a means of communicating with the coachman. The cord is formed of a flexible India-rubber tube, with a mouth-piece at one end, and the other in the shape of the lower orifice of a trumpet. The person in the carriage has only to pull this tube, which the coachman holds in his hand as an ordinary check-string, for him to apply his end of it to the ear, and an order may then be transmitted through the tube, which will be heard by the

coachman, even though it be uttered in the lowest whisper. A reply can be given to the master in the same way.—*Galignani's Messenger.*

SHOES IMPERVIOUS TO WATER.

The soles may be of plaited flax, hemp, or linden bark. For the upper part any kind of cloth may be used, and the shoes lined with linen or cotton. The soles are then varnished or covered with the following composition:—One quart of flax-seed oil, two ounces of rosin, half an ounce of white vitriol, which must be boiled together for half an hour. After which take four ounces of spirits of turpentine, and two ounces of white oak saw-dust, which has been exposed twenty-four hours to the sun; mix these ingredients well together, and put them on the soles of the shoes with a brush, or in any other way, which, when dried, will render them impervious to water.—*Franklin Journal.*

SOCIETY OF ARTS.

THE annual rewards of this institution were distributed on Tuesday, June 12. The subjects, in mechanics and other practical arts, which were honoured by prizes, follow:—

1. To Messrs. G. and W. Bursill, 1, Queen's Head-lane, Islington, for their safe lamp for miners, the silver medal.
2. To Mr. J. F. Goddard, Chatham, for his apparatus for experiments on polarizing light, the silver medal.
3. To Mr. J. P. Paine, 30, High-stret, Bloomsbury, for his escapement-wheel for turret clocks, the silver medal.
4. To Mr. A. P. Walsh, 6, Great George-street, Euston-square, for his remontoire escapement, the silver Isis medal.
5. To Mr. Henry Mapple, 6, Upper Rosoman-street, Clerkenwell, for his resonant spring for a chamber clock, five pounds.
6. To Mr. J. Crockford, 1, Lichfield-street, Soho, for his ball-valve for water pipes, the silver Isis medal.
7. To Capt. J. Ericson, 4, Adelaide-place, London-bridge, for his hydrostatic weighing machine, the silver medal.
8. To Mr. Fred. Danchell, 11, Gerrard-street, Soho, for his tuning-key for a piano-forte, the silver medal.
9. To Mr. W. Baddeley, Wellington-street, Blackfriars-road, for his portable dam for use at fires, the silver medal.
10. To Mr. J. Burkitt, 4, Bartholomew-place, West Smithfield, for his self-supplying tympan to a printing-press, the silver Isis medal.
11. To Mr. W. Levick, 55, Great Ormond-street, for his furnace for type-founders, five pounds.
12. To Mr. C. Jenkins, 1, Harvey's-buildings, Strand, for his adjustable step-ladder, the silver Isis medal.
13. To Mr. A. Geo. Edge, R.N., for his instrument for ascertaining the stability of a ship, the silver medal.
14. To Mr. J. Farley, 2, Hart's-lane, Bethnal-green-road, for his improvement in the broad-silk loom, the silver medal and five pounds.
15. To Mr. Lewis Thompson, at Messrs. Hawes's, soap manufacturers, Lambeth, for his method of preparing Prussian-blue, the gold Isis medal.
16. To the same, for his method of purifying copper, the gold medal.
17. To Mr. Wildman Whitehouse, 4, Francis-terrace, Kentish-town, for his method of making casts from morbid anatomical preparations, the silver medal.
18. To Mr. T. Carrick, Newcastle-on-Tyne, for his marble tablets to paint miniatures on, the silver Isis medal.
19. To Mr. J. Esquilant, 25, St. Alban-street, Kennington-road, for ornaments in leather for mouldings, &c., ten pounds.

Literary Gazette.

THE SCHOOL OF DESIGN.

THE premiums of the School of Design, instituted by Government in 1837, were distributed on July 31. For the best design for *silk hangings*, a prize of ten guineas was awarded to Mr. W. C. Wild, and a testimonial of approbation to Mr. J. D. Jerard; for *ribbons*, a prize of five guineas, to Mr. J. Mogford; for a *shawl*, a prize of five guineas, to Mr. E. C. Clarkson; for a *carpet*, a prize of five guineas, to Mr. C. Gardner; for an *architectural frieze*, a prize of five guineas, to Mr. W. C. T. Dobson, and a testimonial of approbation to Mr. S. Winsor; for a *tea-cup, coffee-cup, and cover, and saucer*, a prize of five guineas, to Mr. W. A. Papworth, and a testimonial of approbation to Mr. J. Brett; for *chintz muslin*, a prize of five guineas, to Mr. T. Ingham, and a testimonial of approbation to Mr. G. Duncumb.—*Athenæum.*

SOCIETY FOR PROMOTING PRACTICAL DESIGN.

IN the schools of this Society, St. Martin-street, Leicester-square, a number of men and boys from different engineer's and factories receive instruction in mechanical drawing; the Society having been formed to give cheap instruction to the people in the arts.

THE POLYTECHNIC INSTITUTION.

THE objects of this Institution (lately established), are stated to be the advancement of Practical Science in connexion with agriculture, the arts, and manufactures; and the demonstration, by the most simple and interesting methods of illustration, the principles of Science, and the processes employed in the Useful Arts and Manufactures. For this purpose, the Society have opened for exhibition the premises, No. 309, Regent-street, extending 320 feet in depth, and including the mansion, No. 5, Cavendish-square.

The interior arrangements of the building consist of a Hall, devoted to Manufactures of various kinds, among others:—

Letter-press printing, performed by a new and perfect self-inking apparatus. *The workshop of an optician*, with lathes and tools for grinding and polishing lenses. *A glass furnace*, for melting, blowing, and working glass of all colours into various articles, and wheels for cutting, polishing, and engraving it. *The workshop of an ivory turner*, with a lathe for turning of every description. Machines with circular saws, &c. *Weaving by power-looms. A rotary steam-engine*, (Earl Dundonald's), giving motion to pumps and other machinery.

Beneath the Hall of Manufactures, a very extensive and complete *laboratory* has been fitted up, adapted for private experimentalists and patentees. On this floor is shewn a method of *making bread* without yeast, and baking it by gas. *Economical cooking by gas. A forge and engineer's workshop. Two steam-engine boilers*, and other machinery.

The principal staircase leads to a spacious apartment, appropriated to the "London Benevolent Repository," a new association of ladies of distinction, for disposing of works of art and ingenuity for benevolent purposes. Over the Hall of Manufactures is a *theatre, or lecture-room*, capable of containing 500 persons, in which lectures on chemistry, natural philosophy, and the chemical arts, are delivered, illustrated on a most extensive scale. *An hydro-oxygen microscope*, by Cary, being the largest ever constructed, is here exhibited on a screen containing 425 square feet. The *Great Hall*, 120 feet long, 40 feet wide, and 40 feet high, contains two *metallic reflectors*, by means of which, whispers may be heard the

whole length of the Hall without a tube, and cooking be performed by a fire 100 feet from the meat. Among a variety of models, specimens of manufactures, paintings, &c., are colossal models of the human ear and eye, every part of which may be separately removed for clearness of explanation. Two curious astronomical clocks, and an orrery, are also to be seen.

In the centre of the Hall are two *canals*, containing a surface of 700 feet of water, attached to which are the appurtenances of a *dock-yard*, affording the means of illustration for lectures on naval architecture. Also, a series of *locks and water-wheels* in motion.

At the junction of the two canals is a large circular reservoir, into which a *diving-bell*, capable of containing four or five persons, is lowered to a considerable depth; air being supplied by two powerful *pumps*, so that visitors may descend with convenience. A diver descends, clothed in a water and air-tight dress, which enables him, in any depth of water, to rise or sink at pleasure, and shew the practicability of raising sunken vessels by divers securing Indian-rubber air and water-tight cylinders and cones, &c., to the wreck, and afterwards inflating them by the air-pump.

THE CHROMAPOLYGON.

Mr. Mordan, the ingenious mechanist, is the originator of this useful recreation, and aid tothe " education of the eye." It consists of geometrical paper figures (rhombics, obtuse angled and equilateral triangles, and right angled triangles), which are susceptible of multiplied combinations of form and colour, after the manner of the kaleidoscope. " By a judicious employment of the various shades of colour, the perspective of solid geometrical figures may be produced, and thus an outline of the science of solid geometry be insensibly acquired. As a source of brilliant ornament it may be applied to the decoration of albums, portfolios, fire-screens, and other tasteful or bizarre objects, suitable to the tables and boudoirs of the opulent."—*Times.*

A correspondent of the *Mechanics' Magazine* objects that, in London, at Tunbridge Wells, and elsewhere, boxes, cribbage-boards, note-presses, &c., have for many years been ornamented in the manner above suggested as a novelty. " The subject has long since been exhausted, not only in this country, but also in France, China, and elsewhere." The application of this *toy* to education in geometry has better claim to merit.

EDUCATION OF THE BLIND.

At the late meeting of the British Association, it was observed, that, though it is a very practicable thing to teach the blind *to read*, it is exceedingly difficult to teach them to think accurately. In every instance where a visible image is introduced, the meaning is more or less vitiated; and the integrity of the mind, by constantly receiving what it cannot understand, is endangered.

BUILDING WITHOUT SCAFFOLDING.

An ingenious contrivance for building an obelisk without scaffolding is described in the *Transactions of the Society of Arts*, vol. li. pt. 2, lately published. It was designed by Mr. T. Slacks, mason, of Langholm, in Eskdale, Dumfriesshire, and employed by him in the erection of a monument in that neighbourhood, in memory of Sir John Malcolm. The obelisk is hollow, with thorough bond stones inserted occasionally for

strength. These bond stones were perforated in the centre, to allow free passage for a pole, forty feet long, passing through three of them, and working with a collar of hard wood on the topmost of them, turning freely on friction balls. This pole was furnished with a cross beam at top, having pulleys at the ends, and various ingenious contrivances for raising the materials by means of a windlass below. The pole was raised successively from one station to another, as the work progressed; an operation so easily performed as to occupy only two hours. The pyramidal apex of the obelisk was finished by means of a hanging scaffold; the pole having been sawn off at the last course before the beginning of the apex, and buried in the work.

The column lately erected at Plymouth to the memory of Nelson, by Mr. Foulston, was likewise constructed without scaffolding.—*Abridged from Civil Engin. and Arch. Journal.*

EXPANSIBILITY OF THE DIFFERENT KINDS OF STONE.

MR. ALEX. J. ADIE, Civil Engineer, has performed an extensive series of experiments upon different kinds of stone, as well as upon iron and upon brick, poreclain, and other artificial substances. The instrument employed was a pyrometer of a simple construction, capable of determining quantities not greater than one-thirty-thousandth of an inch. The length of the substances generally employed was twenty-three inches. The general result of these experiments is, that the ordinary building materials of stone expand but very little differently from cast-iron, and that, consequently, the mixture of those materials in edifices is not injurious to their durability. The experiments from which the expansibility of the substances was numerically determined, were made between the limits of ordinary atmospheric temperature and that of 212°, steam being introduced for that purpose between the double casing of the instrument.

The following results were obtained for the fractional expansion of the length, for a change of temperature of 180° Fahr. :—

Table of the expansion of Stone, &c.

		Decimal of length for 180° Fahr.
1.	Roman cement	.0014349
2.	Sicilian white marble	.00110411
3.	Carrara marble	.0006539
4.	Sandstone from the Liver Rock of Craigleith Quarry	.0011743
5.	Cast-iron from a rod cut from a bar cast two inches square.	.00114676
6.	Cast-iron from a rod cast half an inch square	.001102166
7.	Slate from Penrhyn Quarry, Wales	.0010376
8.	Peterhead red granite	.0008968
9.	Arbroath pavement	.0008985
10.	Caithness pavement	.0008947
11.	Greenstone from Rutho	.0008089
12.	Aberdeen gray granite	.00078943
13.	Best stock brick	.0005502
14.	Fire brick	.0004928
15.	Stalk of a Dutch tobacco pipe	.0004573
16.	Round rod of Wedgewood ware (11 inches long)	.00045294
17.	Black marble from Galway, Ireland	.00044519

Transactions of the Royal Society of Edinburgh.

RESEARCHES IN ROTATORY MOTION.

On May 14, a paper was read to the Royal Society, entitled "Researches in Rotatory Motion," by A. Bell, Esq. This communication, which is altogether analytical, contains several new theorems in rotatory motion, respecting the effect of the centrifugal force arising from a rotation about any axis, in producing rotation about another, inclined at any angle to the former; and also a new and comparatively concise demonstration of the equations of the motion of rotation of a solid body, its centre of gravity being fixed, and the body being acted on by any forces. —*Philosophical Magazine.*

TURBINE ON THE PRINCIPLE OF BARKER'S MILL.

An hydraulic wheel with this name has been invented by M. Fourneyron, worked by water pressure, which is stated to have excited much interest in Germany: for it is said that a turbine, only thirteen inches diameter, working on an axle, under a vertical pressure of water of 118 yards, revolved 2,300 times in a minute, and expended only forty-six grains troy of water per second; yet realized a power which, estimated in steam, would be equal to that of sixty horses. M.M. Prony, Arago, Gambry, and Savary, who have reported on it, say:—"We may have an idea of it in conceiving an ordinary wheel with curved palets, placed on a flat dish, and the water, issuing from the centre, arrives at the palets, and makes its exit at the circumference."—*Railway Magazine.*

Objection was, at first, made that the machine would soon be out of order, in consequence of the extreme velocity with which it turns on the pivot. The inventor has, however, discovered the means of supplying oil in the step in such a way as to meet this difficulty, which method is a secret.

IMPROVEMENT IN WATER-WORKS.

The new filtering reservoir of the Chelsea Company occupies a space of 48,000 square yards superficies. The filtering bottoms consist of 12,000 cubic yards of pebble, silicious gravel, and shelly sand; the cost of construction being £57,000. The pipes are laid eight feet below the surface of this bottom, through which the water is filtered and cleansed before it passes into the wells from which the mains are supplied.—*Courier.*

STOCKER'S PATENT HYDRAULIC MACHINE.

This very simple and useful machine consists of a neat brass cylindrical standard, thirteen inches high, and two inches and a half in diameter: it is intended as a substitute for the common beer machine, and is particularly applicable to dressing-rooms, in houses where the cistern is in a lower story. For taverns it will be found very serviceable for drawing beer or spirits, or for water to supply the counter or washing stand. The stroke is regulated to draw exactly half or a whole pint at one pull; and every part of it can be unscrewed to clear out any dirt, particularly the lower valve, which can be easily taken out, wiped, and replaced. It requires no stuffing-box, as the present beer-machines do; it is easily fixed, and is attached to a ferrule (previously soldered to the pipe) by a union-nut and screw, and can be as easily removed.—*Civil Engin. and Arch. Journal.*

NEW WATER POWER.

Mr. W. Allison, of Greenock, has discovered the following novel application of water power. The apparatus consists of a cylinder and a piston, similar to those employed in a steam-engine. To the cylinder are two entrance and two discharge pipes, one of each on each side of the stuffing-box of the piston. The same turn of the cock admits the water into one part of the cylinder, and opens the discharge pipe in the other; thus forming a vacuum. To work this, advantage is taken of the pressure of the Shaw's Water, the height of the reservoir of which gives it a force of sixty pounds to the inch, in the lower parts of the town of Greenock. In an experiment made with a cylinder two inches in diameter, worked with a jet of water somewhat less than a quarter of an inch in diameter, the piston, although loaded with one and a half cwt., rose and fell sixteen times in the minute. In this case, the entrance and discharge pipes were of equal size, and the cylinder was placed in a vertical position. In another model, made with the cylinder laid horizontally, and with the discharge pipes nearly three times as large as the entrance ones, the motion was increased to twenty-six double strokes in the minute. One use to which this invention is peculiarly applicable, is the hoisting of heavy goods into warehouses. The Shaw's Company, for £7 a-year, gives a supply of water equal to 1,000 gallons per day. This water, injected into a cylinder ten inches in diameter, it is calculated, will raise to the second floor 300 tons per day; to the third floor, 200 tons; to the fourth, 150; and to the fifth, 100 tons: the cost of the water for each day's work being about 5*d.*, and the rate of raising being thirty-nine feet per minute. These calculations are made upon the pressure of water introduced into the town for domestic purposes, but a pipe from the compensation dam at the paper-mill, from its superior height, would give a pressure of about 200 pounds on the inch.—*Greenock Advertiser.*

BLOWING UP OF WRECKS IN THE THAMES.

Colonel Pasley has been engaged in the important applications of his military attainments as Colonel of the Royal Engineers, to practical purposes in the arts of peace; at the same time benefiting navigation by the removal of wrecks from the beds of rivers.

The first explosion was required to remove the wreck of the collier brig William, of 400 tons burden, laden with 300 tons of coal, sunk off Gravesend, near Tilbury Fort, in about twenty-three feet water at the lowest tides. For this purpose, two cylinders, each capable of receiving a charge of 2,500 pounds of gunpowder, were prepared at Chatham Dockyard. They were made of lead, and cased with elm, three inches thick, ten feet long, and four feet diameter, which was further strengthened by longitudinal bars connected at the ends by a framing. They were also hooped with iron, the hoops being, however, nearly cut through on the side intended to be next the brig, that the force of the explosion might be most profitably employed. Into the cylinder was fixed a fuze, communicating directly with only a small powder canister in the centre of the charge, to guard against the accidental admission of the water. The mode of explosion adopted was by a small powder hose, guarded by a leaden pipe. In the side of the wreck were fixed ring-bolts, to which the cylinder was attached; these operations being performed by means of the diving-bell and diving-helmet, by a body of royal sappers and miners.

On Monday, May 21, unfortunately, a diver who was sent below to

fasten the bolts, lost his life; next day the fuze and small canister were spoiled by the accidental irruption of the water. It was not till May 28, that the expected explosion took place; when, all being ready, and signals made to keep all craft clear of danger, the fuze was fired by a party of miners in a cutter. It burnt for five minutes, giving time for the party to escape safely. The explosion was terrific: by land it was felt distinctly, though without danger, in all the neighbouring houses, and the water in the river was thrown up in a column, some say seventy, others 100, feet high. The dense black vapour which arose at the same time, shewed that the cargo of coals had been effectually reached, and the floating masts, planks, and timbers, proved that the wreck was disturbed, if not demolished.

The second explosion took place under the same able direction as the above, on Tuesday the 5th of June. The wreck was that of the schooner Glamorgan, sunk athwart the channel of the Thames, a little to the westward of Coalhouse Point, Gravesend Reach. The depth of water was five fathoms before the explosion, and from seven to seven and a half afterwards. The visible effect, Colonel Pasley describes as "a very brilliant cone of clear water, sparkling in the sun, probably thirty or forty feet high, succeeded by a second water-spout of dark appearance, being mixed with mud from the bottom, and tinged with gunpowder." Timbers, planks, &c. were found abundantly floating, as in the former instance; and the charge of powder was the same in amount, and in application, as that before described.

For these succesful operations, the Corporation of London have presented to Colonel Pasley, the freedom of the City, enclosed in a gold box, of fifty guineas value.

BLOWING UP OF THE BOYNE.

In September last, Mr. Abbinett made a second experiment of blowing up the wreck of the Boyne, off South Sea Castle, Spithead, which was burnt and sunk in 1796. On this occasion, there being eighteen feet over every part of the wreck at low water, 630 pounds of powder were exploded, being enclosed in an oil hogshead, into which two stop-cocks were inserted; to these were attached two leaden tube pipes, containing an igniting match of forty-five feet in length; at the upper end of each were attached portfires, which would burn about four minutes. As the magazine was lowered, it was hauled into its intended situation by a rope leading through a block, previously lashed to, or near the kelson of the wreck. The part fixed on was under the larboard bilge, abreast the main-chains, with, at least, twenty feet of the bottom overhanging the ship lying on the opposite bilge. At this place, about thirty feet of the bottom aft was entire, which is now destroyed, or laid flat, as well as also the bottom for forty feet forward. The whole wreck now, therefore, is dispersed on the ground, the fore-part having been destroyed in the original burning; and the tides, which run here pretty strong, soon washed off the mud, which had accumulated some feet in depth.

When the magazine was safely landed, the two portfires, with the upper ends of the lead tubes, projecting upwards about two feet, were securely lashed to an eighteen gallon cask as a float; all boats and vessels were ordered to withdraw, and Abbinett having fired the matches, withdrew himself. On the explosion taking place, a huge mass of water, about forty feet square, rose up for about six feet, and then broke in the centre, throwing up several foamy columns for about ten feet higher.

A low report was heard, as of a heavy explosion at a great distance, but neither flame nor smoke was apparent.—*Hampshire Telegraph.*

IMPROVEMENT OF DOVER HARBOUR.

LIEUT. WORTHINGTON, R.N., has published his plan for the improvement of Dover harbour, in which he proposes to run out the south head as a breakwater to 250 feet into the sea, in a S.S.E. direction; to take down part of the north head, and make a large addition to the harbour in front of Amherst battery, with sloping beach shores; with a number of other important and minor improvements. The waters of the Rose he proposes to turn along the back, or south side of the breakwater. From the joint action of this and the lower side, which runs east, he expects the shingle will be carried off past the mouth of the harbour, and added to the beach opposite the esplanade. This plan has been submitted to the Commissioners of Dover harbour, with nearly twenty testimonials of its merits from seamen and naval officers of rank and experience; yet, for some unexplained reason, the Commissioners do not see fit to try it.—*Railway Magazine.*

IMPROVEMENT OF NEWCASTLE.

THOSE who have never seen Newcastle can form no idea of the immensity of business there carried on. Its population, including Gateshead and the adjacent neighbourhood, exceeds 100,000, and the tonnage in and out of its river surpasses that of any town in the kingdom, London alone excepted. About seventy steamers are employed in towing vessels up and down the river, whose banks, for miles together, in the busy scene and number of manufactories, rival those of the Thames itself. Of the street improvements we have only space to observe, that an individual (Mr. Grainger) is expending, at least, half a million of money in buildings and streets which cannot be surpassed in England, if they can, indeed, be equalled. The Central Exchange Room, in which the evening meetings of the British Association were held last autumn, could accommodate 6,000 or 7,000 persons.

Sunderland, a little place on the neighbouring coast, and but a few miles off, builds upwards of a vessel a day. As to railways, this part of the country may be called the hot-bed of them. Colliery railways exist out of number. Of the success of main lines, it will be enough to instance the Newcastle and Carlisle. This line, whose traffic was estimated at £28,000 per annum, is now actually receiving upwards of £75,600. The boldness of the works on these lines exceeds anything we have yet seen in our southern regions.—*Railway Magazine.*

COMPRESSION OF WATER.

ACCORDING to the experiments of Professor Orsted, the compression of water is .0000461 by a pressure of twenty-five pounds per square inch; and he has found that it proceeds *pari passu*, as far as sixty-five atmospheres—the limit of his experiments. This compression is about equal to reducing a given bulk of water one-sixteenth of its volume by a pressure of 20,000 pounds per square inch.—*Hood, on Warming Buildings.*

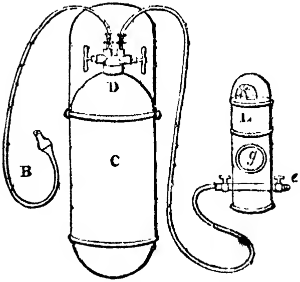
NEW ACOUSTIC INSTRUMENT.

DR. SCOTT, of the Strand, has invented a curious instrument, to which he has given the name of "the Soniferon." It resembles a hookah pipe, but is longer: the bell, instead of resting on its open part, is placed

horizontally on an upright leg, on which it revolves, and it can be set upon a table, so as to bring the mouth of it completely opposite the mouth of the person about to speak. From the apex of the bell, or rather cone, proceeds a pipe of silk, having, at the extremity, an ivory tube, which is placed in the ear of the deaf person. The mouth of the cone is covered with a perforated metallic plate, the inside being formed somewhat after the interior of the shell of the nautilus, with spiral chambers; at the extremity of which the gyrations of sound concentrate, and are conveyed along the pipe by the tube into the ear, being refracted in their transit by a sounding-plate of well-tempered metal, which increases their intensity, and, as it were, defines their intonation. The results of experiments with this instrument upon deaf persons are stated to have been satisfactory; its effects upon a person not deaf are singular, since they render him alive to the lowest whisper.—*Abridged from the Observer.*

NEW SAFETY LAMP FOR MINERS.

THIS invention, by Messrs. Bursill, consists of a portable iron cylinder C, being highly charged with condensed atmospheric air. At one end of this cylinder is a double-way-cock D, to supply L, the safety-lamp, and B, the flexible tube for breathing, when required. Attached to this cock D, is a spring-regulating valve, so contrived to suit the internal pressure in the cylinder as only to admit a sufficient quantity of air to support combustion in the lamp, when thirty or forty atmospheres are condensed in the cylinder. Thus, a regular pressure, and steady supply of atmospheric air, are insured to the lamp when in use, until all the condensed air contained in the cylinder is exhausted.



(Bursills' New Safety-Lamp.)

The safety-lamp L, is enclosed in an air-tight lantern, glazed with a large convex lens g, through which a strong light is emitted. The flame of this lamp is very economically supplied with a stream of pure atmospheric air, directed to the exact place of combustion in the lamp. On the top of the lamp the rarefied air passes off through a flue into a body of water, which forms a water-joint, so as entirely to exclude any admixture of the gases in the mine with the internal arrangement of the safety-lamp. *e*, is a small stop-cock, with a screw, for the purpose of applying the lamp to the tube of a fresh charged cylinder.

A number of these cylinders, prepared with straps to fasten on the back, are proposed to be charged with pure atmospheric air from an air-pump, worked by the steam-engine, and afterwards to be lowered into

the mine for the use of the miners. It is calculated that one of these small portable cylinders will contain a supply of atmospheric air for three or four hours. Cylinders on a larger scale, similarly charged, are intended to supply any number of these safety-lamps that may be requisite to light any part of the mine, and also to be used as reservoirs, when necessary.

With certain modifications, the inventors consider the above apparatus may be employed to support life in submarine and subaqueous works. It is called the life-lamp and life-apparatus, and will, doubtless, prove valuable in abating the frequency of the disasters incident to mining.—*Railway Magazine.*

MAGAZINE GUN.

M. HEURTELOUP has submitted to the *Academie des Sciences*, the gun invented by him in 1835, which he has now improved, and calls a "*Fusil koptipteur.*" It is primed by means of a flattened metal tube, filled with fulminating powder, which is divided, without detonating, into priming portions by a thin piece of metal. This piece is set in action by the trigger, and after detaching the priming, it acts as a hammer to crush the powder. In cocking the gun, the cylinder advances by a quantity equal to that which was used in the preceding charge. One may, however, cock the gun without priming it; it being merely necessary for this purpose, to hold the gun horizontally, with the underguard uppermost. This is one of the improvements. Another is in the disposition of "*la batterie,*" which consists of a small number of simple pieces, of a form easily to be obtained, always identical, so that if one be damaged it may easily be replaced without the necessity of re-adjustment. The gun takes thirty-five charges, and in a little time is refilled. The *Academie* has made a long report in favour of the invention for the purposes of war.—*Railway Magazine.*

PERCUSSION LEAD FOR SUBAQUEOUS EXPLOSIONS.

CAPTAIN NORTON has applied his percussion lead with success, as a substitute for the fuzes at present in use, being more simple, less costly, and easy of application. A sea lead is charged at its heavy end with a small iron tube, having a percussion cap at each end, filled with gunpowder. The lead has two eyes, or rings, on its sides in a straight line, through which a cord is run, one end being attached to the box of powder, at the bottom of the water; the lead is allowed to slide along the cord, and on striking the box, explodes it; a thin piece of sheet lead or copper being fixed to the box, when the percussion primer strikes.—*Civil Eng. and Arch. Journal.*

PROJECTILE EXPERIMENTS.

A VARIETY of experiments, on a new projection, to afford assistance to distressed vessels at sea, have been made at Brighton. The improvement consists in the use of rockets to propel a rope to any object at sea, instead of a mortar, as hitherto used with Captain Manby's apparatus; the advantages being, the greater ascent of the rocket, and the increase of power. A rope was several times thrown to a boat moored about 250 feet at sea, as well as 200 feet beyond, without the failure hitherto so frequently experienced with the mortar, which detached itself from the rope by the violence of its exit. The manner also of directing the rocket, by a case mounted on a swivel, is simple and effectual.—*Brighton Newspaper.*

NEW SAFETY BOAT.

Mr. Joseph Francis, of New York, has built a boat twenty-eight feet long, and five and a half wide, the planks of which overlap, and are solidly fastened with copper nails. The side planking is double, within which are fourteen tubes, thirteen feet long, extending from the keel to the deck, and holding fifty-two feet of hydrogen gas, which will buoy up about 4,000 pounds weight, when the boat is filled with water. To the sides of the boat are attached twenty life-ropes, which could sustain 100 persons, if necessary.—*Railway Magazine.*

FUEL FROM COMPRESSED PEAT.

Lord Willoughby de Eresby has been sedulously occupied with the improvement of his peat-compressing machine, invented in the year 1837; and during the past year a perfected instrument has been exhibited at work in the manufactory of Mr. Napier, the engineer, York-road, Westminster-bridge. In the experiments, the common moist and wet peat was put into the chamber, and compressed by a lever (longer than that formerly employed, and, consequently, more powerful), the water running abundantly through the channels of the machine. The specimen was then taken out and shewn to be reduced in size, and confirmed in solidity. Lord Willoughby proposes not to apply a second pressure immediately, but to go on with single actions, and leave the peats for some twenty-four hours, in which time the internal wet will be brought to the surface; and, when the material is pressed a second time, it will become more hard and free from moisture than if both processes had been employed closely together. Thus, peats which had been pressed two days previously, were shewn to be perfectly dry, heavy, and consistent; and some that had been preserved for a year were scarcely to be distinguished from coal. As fuel for the manufacture of the finest cutlery, this peat is superior to coal, probably from being without sulphur. It can always be obtained by the lowly population of a large portion of the British empire with infinitely less cost of labour and time than the mere cutting and drying of turf or peat. It may also be advantageously employed in lime-burning, and in fires or furnaces, working machinery, or raising of steam.—*Abridged from the Literary Gazette.*

PATENT WARP MACHINE.

A patent machine has been set to work at Mr. C. Todd's weaving factory, Hutchesontown, by Mr. George Smith, of Manchester, for the purpose of stretching and drying warps; that is, preparing the threads for the weaver, which is usually done by dressing-machines. It is capable of thoroughly finishing about 100 yards of warp in a minute, or 6,000 yards an hour, each chain containing about 2,000 threads. It is the first erected in Scotland; but they are already numerous and becoming universally adopted in England.—*Inverness Courier.*

NEW MICROSCOPIC APPARATUS.

M. Dujardin has invented an apparatus in which, by means of achromatic lenses, fixed in a tube at the foot of the instrument, the illuminating light appears to issue from the objects themselves, and thus avoids the effects of diffraction, which often gives to small lines a false diameter. A greater clearness is thus given to objects, and a permission to an indefinite augmentation of the light.—*Railway Magazine.*

SMOKY CHIMNEYS.

AN able critic, in the *London and Westminster Review*, observes, that "one very common cause of smoky chimneys, where no apparent reason can be discovered, arises from the practice of using boys to sweep them. For a flue to draw well, it is essential that there should be only two openings into it, one at the bottom and the other at the top. Now chimney-flues are divided from one another by single courses of bricks in width, or 'half-bricks.' These flues are built with lime mortar, which is soon restored to the state of quick lime by the heat of the fire, and falling out in powder, leaves gaping chinks for misdraught between the bricks, destroying the continuity of the flue. To provide, in some measure, against this evil, the inside of the flue is coated with lime-mortar and cow-dung, which the climbing-boys frequently break away, and the chimney, opening into chinks, produces an imperfect draught. This is an evil, for which there is no remedy, except rebuilding the chimney. Were it the practice to use iron tubes, built into the thickness of the walls, or to introduce hollow iron columns upon the face of the wall, covering them in the apartments with perforated screen partitions, the great source of evil would cease, and the still greater evil, the crime, the degradation of humanity, would cease also."

TREADMILL FOR HORSES.

A SUCCESSFUL experiment has been made on the Southampton Railway, of a new machine, intended as a substitute for a locomotive on railways, more especially on short or branch roads, where the expense of a locomotive engine would be too great for the traffic. The action is produced by a horse walking at an ordinary pace in a jointed platform attached to the vehicle, and by concealed machinery, which is so contrived, that his muscular strength and weight are brought to act together, and communicate a multiplying force to the larger or outside wheels of the machine; which power may be increased or diminished, and the speed regulated, at the will of the conductor. On the first application, in the above trial, the horse moved at a pace of four miles an hour, and subsequently conveyed the machine, which, with thirteen persons riding in it, weighed four tons, at the rate of sixteen miles an hour.—*Courier.*

IMPROVED FRENCH CABLE.

A COMBINATION of the hempen with the chain cable has been introduced into the French navy, with some success; the chain cable being affixed to the anchor in the usual way, in length from twenty-five to forty fathoms. The object of this arrangement is to allow the chain to drag along the bottom of the sea, and prevent abrasion to the hempen cable. Thus, it is supposed, that greater elasticity is produced than can be obtained by a chain cable alone, and the durability of the hempen cable is prolonged. The cable also being lighter and more manageable, is more favourably adapted for the evolutions of the ship, either in casting or weighing anchor, likewise for kedging: the advantages of lightness are evident; and there are other recommendations besides cheapness.—*Civil Eng. and Arch. Journal.*

NEW HAY RAKE.

THIS rake is of American invention, and consists of a light beam, or stock, nine feet in length, to which are attached, before and behind, rows of teeth. It is drawn over the sward by a horse, and as soon as the

interstices of the teeth are filled, the workman in attendance moves a handle, which turns the rake over, and presents the side which has hitherto been empty. In this manner, the hay is deposited in little heaps through the field. The principal advantages of the implement are, that it economises labour in a very busy season, and, at the same time, sweeps the field with the greatest nicety.—*Dumfries Courier.*

NEW CARRIAGE DRAG.

Mr. John Houlston, of Wellington, Salop, has invented an apparatus to serve as a drag, or "retarder," for carriage wheels. It is contained in a circular box, about nine inches in diameter, and is fitted at each end of the axletree, between the wheels. It is worked by a lever, placed at the command of the driver; and, though it allows the wheels to revolve, the drag upon their motion is stated to be four times that usually applied to railway carriages. By reversing the action of the lever, the wheels may be locked, so as to prevent the carriage being backed, in case of the horse *jibbing.*—*Macclesfield Courier.*

ROE'S PATENT WATER-CLOSET APPARATUS.

The following are the advantages of this invention:—It is not requisite to have the complicated apparatus which is attached to the common closet, viz., water-box, valves, lever, cranks, or wires, a separate pipe to each closet, and frequently a cistern also. Mr. Roe's closet, however many there may be in a building, can be supplied from one cistern (if it be above the highest closet), and one main pipe, with branches to the several closets. The principal improvement seems to be in the basin: round the rim is a small chamber, with an aperture all round the pan, from which, in addition to the fan at the back, the water flows immediately the valve-cock is opened, and completely cleanses the pan.—*Civil Eng. and Arch. Journal.*

PATENT PUMP.

A double action horizontal pump, of recent invention, has been adopted at the Trade's-lane Calendering Company's premises, Dundee. It throws out a copious stream of water without any intermission between the strokes, and without the friction of an ordinary pump. It may likewise be converted into a fire-engine, with a leather attached to it for raising water. When thus employed, with two men working at the handles of the pump, a column of water may be raised to the height of forty or fifty feet, scarcely inferior in size and force to that discharged by an ordinary fire-engine, wrought by a dozen men.

STRENGTH OF IRON.

The temperature of maximum strength for cast iron has been estimated at about 300°; but the Committee on the Explosion of Steam-boilers, appointed by the Franklin Institute, consider that the maximum for wrought iron is very rapid; at a red heat, or about 800°, it is only one-sixth of the maximum; so that in a range of less than 500°, it loses five-sixths of its strength. * * * As the relative strength of wrought iron at 300°, and at 800°, is about six to one; therefore, if the temperature of the iron above 300° *increases*, in an arithmetical progression, whose rate is 100°, the relative strength will *decrease* in an arithmetical progression, whose ratio is one.—*Hood's Practical Treatise on Warming Buildings.*

PRESERVING TIMBER.

A PATENT has lately been taken out for this purpose in America. It consists of a "metallic solution," made by steeping well-rusted iron hoops, or tin cuttings, in the essential oil of tar, for about six weeks, during which it should be repeatedly pumped from one cask to another; by which time the oil will have become very black and much increased in gravity, whilst the iron hoops and tin cuttings will appear bright and free from oxide. They are then taken out, the oil is burnt off, and laid by for re-oxidation, to be facilitated by pouring over them salt and water; when again become rusted, they will be fit for use. With this solution may be saturated piles already driven into the sea, forming jetties or piers, by passing an inch augur down the centre, and filling the hole with the liquid; which, oozing through the pores of the wood, will deposit an incrustation of iron, which, combining with the essential oil of tar, resists alike the action of the water and the attacks of the worm; and a wooden plug, or tree-nail, is then driven into the hole. This method is likewise applicable to the timber used in blocking streets, wood-work on railways, and all wood subject to damp. For out-door buildings, liable to dry-rot, it may be used cold, as varnish or tar.

ANTI-OXIDATION OF METALS.

SEVERAL specimens of copper and iron, prepared by Mr. Wall, with a view to prevent their oxidation, have been submitted to competent examiners. "The Mary," in Her Majesty's dockyard, at Woolwich, has been sheathed with Mr. Wall's prepared copper; a certificate, signed by the Vice-Admiral, and other officers of Sheerness dock-yard, states that "the surface resists all action by acids, and that they are of opinion, that it will resist any chemical action of the salt water." Upon specimens of this prepared iron and copper, neither very strong muriatic or nitrous acid produce any apparent change.*

ANTI-COMBUSTIVE MIXTURE.

ON Feb. 26, a communication was read to the Institute of British Architects, from Baron Wittersteaf, describing an anti-combustive mixture for the saturation of timber, so as to render roofs, floors, &c., less liable to ignition. The timber is to be placed in a solution of soda, in water, in a trough, hermetically sealed; the air is then to be exhausted by the aid of an air-pump, and left for six or seven days, when the atmosphere is to be re-admitted; after remaining for a short time, the timber is to be taken out, when it will be completely saturated with the solution, which consists of four or five pounds of soda to each gallon of fresh water. If cotton cloths, or other inflammable materials, be dipped once or twice in the solution, and mixed with a small portion of starch or glue, gum arabic, gum dragon, &c., they will not inflame; but for wood these glutinous substances must not be added, else they will impede the absorption in the fibres of the wood.—*Civil Eng. and Arch. Journal.*

* Mr. Crawshay is said to have sold his extensive tin works at Trefforest, Newbridge, for this manufacture. Mr. C. himself retains a considerable interest in the establishment, and is one of the directors; his son, Mr. Francis Crawshay, continues the principal manager. Some persons believe that the above discovery will produce a complete revolution in the tin-trade: time will shew.—*Gloucestershire Chronicle.*

INCOMBUSTIBLE CLOTHING.

If cotton and woollen articles of dress, after washing, be rinsed in a moderate solution of nitre, it will prevent their readily taking fire, and, at the same time, will improve their appearance.

PREPARED CHARCOAL FOR FUEL.

Charcoal, broken into small pieces, and steeped in a mixture composed of two gallons of water, one pound of quick lime, and ten ounces of salt, can be burnt at a slow rate, without the evolution of carbonic acid gas being sensible. It is known that lime will never absorb more than from sixty-two to sixty-four per cent. of the carbonic acid gas of which it is deprived by burning; also, one pound of charcoal will, during combustion, produce as much carbonic acid gas as can be absorbed by three pounds of lime.—*Proc. Instit. Civil Engineers.*

NEW ACT RELATING TO BUILDINGS.

The statute of 25th George III., c. 27, for the better regulation of buildings, and more effectually preventing mischief by fire, and by which a person was prohibited, in the penalty of £100, from carrying on any manufactory for the distillation of turpentine, &c., in quantities above ten gallons at a time in any place within seventy-five feet of another building, (except in buildings then in use for carrying on such manufactories,) is repealed. so far as relates to the exception, by the act 1 and 2 Victoria, c. 39, passed at the close of last session; and the above penalty is declared to extend to the owner of any turpentine distillery within the distance of seventy-five feet from any other building, unless such other building adjoining the distillery be occupied jointly by the tenant of the latter, and the whole of such buildings (including the distillery and premises adjoining,) be seventy-five feet distant from other buildings. The act contains, however, a proviso, that the proprietors of distilleries which have been in operation thirty years are not to be liable to the penalty until the 1st of August, 1840.—*Times.*

USES OF KAURI RESIN IN THE ARTS.

The kauri wood of New Zealand was first noticed by Capt. Cook, as a very fine mast-timber; but it is only lately that some cargoes of it have been received in this country (at Plymouth dock-yard), which fully bear out the high reputation which this wood had previously attained. Mr. Yate describes the tree under the name of *Dammara australis*, or *Pinus Kauri*, as running from eighty-five to ninety-five feet high without a branch, and sometimes twelve feet diameter, yielding a log of heart timber eleven feet diameter. One he measured, perfectly sound, forty feet eleven inches circumference. The wood has much the appearance of deal, and yields a strong odour of the resin. The tree is crowned with splendid foliage; its leaves resembling those of the English box. From the trunk oozes a white, opaque substance; also a kind of resin, answering the purposes of resin in ship-building; both having a strong resinous smell, the former very fragrant, and chewed on that account by the New Zealanders. Both diffuse themselves over the whole tree, the cone and leaf being equally tinctured with them, whilst they may be seen exuding from the tips of the leaves on the highest branches. Mr. Prideaux, of Plymouth, who has communicated to the *Philosophical Magazine*, a paper on this resin, concludes the first of the above substances to be the more recent exudation, and to be more or less compressible, from

the presence of its essential oil; whilst he considers the resin to be that which has lost by time, or exposure, the essential oil and a little moisture, and thus become hard and transparent. In looking over several hundred weights, in Plymouth, Mr. Prideaux found the resin in every stage of the difference.

Mr. Prideaux next details a series of very interesting experiments with the kauri resin, and deduces therefrom its several uses in the arts. From its hardness, fragrance, and brilliance, the white parts seem well suited for varnish-making, for which its solubility in alchohol gives it great advantage. Harder and more free from colour than mastic, quite as soluble, and at, perhaps, less than one-tenth the price, it seems to be an important addition to our materials for alcoholic varnishes. It may, indeed, come to be placed at their head, though its insolubility in pyro-acetic acid is an unfortunate limit to its utility. Its hardness, fragrance, and inflammability, pointed it out as suitable for sealing-wax; but combined with lac and turpentine it answers better, and the manufacturer will soon ascertain the fittest proportions. Mr. Prideaux best succeeded with kauri, lac, each one ounce; resin three-quarters of an ounce, oil of turpentine half an ounce, vermilion one ounce; powder together the lac, kauri, and resin; add the vermilion, and then the turpentine. Let them remain a few days in a well-covered vessel, then melt them together in a very gentle heat. The kauri will liquefy in this composition: it burns well, drops freely, and takes a fine impression, but it does not always adhere firmly to the paper. Another purpose for which its brilliant inflammability and comparative infusibility qualify it, if it come in largely and cheaply, is gas-light. A modification of the oil-gas apparatus would work it, and the material being supposed at one-fourth the price of oil, whilst the original outlay in pipes, &c. would be in the same proportion as for oil-gas, it would stand a fair chance in competition with coal-gas, and be much less disagreeable in houses than any gas hitherto employed. As to its officinal employment in medicine and surgery, time and experience only can indicate them. External application seems most suited for it; for its masticatory employment is not very likely to be adopted in Europe.

STEARINE CANDLES.

On January 26, Professor Brande, delivered at the Royal Institution, a Lecture on the Manufacture of Candles from Stearine. In the early part, he gave a very copious explanation of M. Chevreul's discoveries with regard to fatty bodies. The stearine used by the manufacturers, is obtained from the St. Petersburgh or Odessa tallow, although it is sometimes used when procured from vegetable oils. It is converted into stearic acid by boiling it with one part of quicklime to eight of stearine, and afterwards separating it by sulphuric acid. It is further cleansed from olaic acid, which is present, by congealing it, and subjecting it to pressure. The stearic acid thus procured is not quite pure; it is again and again washed with a weak acid, and the same process is repeated, to abstract from it whatever olaic acid may remain behind. The pure stearic acid is semi-transparent, has a waxy appearance, and closely resembles spermaceti. It is melted in a silver pan, because other metals would colour it; when at a proper temperature, it is poured into the moulds, and forms a candle closely resembling one made with wax. If the temperature be raised too high, the acid crystallizes, and becomes brittle; two qualities by which it is rendered nearly unsaleable, but which may be

prevented by the addition of a little wax, magnesia, or French chalk. Manufacturers, however, had recourse to a very pernicious practice, employing white arsenic to prevent this brittleness. At first, a very small quantity was used—viz., one-eighth of a grain in a candle, and on being remonstrated with for using it at all, one of them said, "Why the doctors employ it in small doses as a most valuable tonic." In process of time, however, the quantities were much increased, eight ounces being added to the hundred weight; but since the investigation that has taken place, and since the publication of the various facts relative to the employment of this poison, manufacturers have almost entirely ceased to make use of it, so that the expression of public opinion has, in this instance, been of service.

IMPROVEMENT IN THE COMMON VICE AND VICE-CHUCK.

Mr. R. Wilson, engineer of Edinburgh, has submitted to the Society of Arts for Scotland, an improvement in the Common Vice, and Vice-chuck, whereby the action of the screw is made perfect. The great and acknowledged defect of all vices which turn on centres is, that the screw cannot act fairly at all distances. The very simple and efficient plan adopted by Mr. Wilson is to give the moveable arm such a form as may cause the nut to bear on its diameter, to whatever distance the cheeks of the vice may be opened; in this way, preventing entirely any undue strain upon the screw, and the wearing out of the parts obliqtely strained.

Mr. Wilson fixes in the chuck and hand-vice a straight screw on one of the arms, as firmly as possible, and works it by means of a nut accurately fitted; or in the table or bench-vice, he fixes the box, instead of the screw, to the stationary arm, and works it by means of a straight screw; or allows the nut to be loose, as at present, which gives it the same advantages as the screw. Mr. Wilson next causes the nut, or shoulder of the screw, to work square upon its bearings, so as to transmit the pressure directly along the axis of the screw. This is accomplished by an elongated hole in the moveable arm for the screw to pass through, and by forming the sides of that hole to a particular curve. The nature of the curve is this:—in any position of the vice, if the plane where the axis of the screw cut the curve be noticed, a plane touching the curve surface must be perpencular to the axis of the screw; by which means the screw and nut always act directly, giving a full, steady, and dead pressure to the article grasped, while all the parts are saved from undue wearing. The peculiar form of the curve gives it other advantages, especially increase of strength.—*Jameson's Journal.*

THE LUXOR OBELISK, AT PARIS.

The conveyance, the laying down, and the accessories, cost 560,000 francs; the granite base upwards of 190,000 francs; so that, altogether, this monolithe has cost the French Government 1,700,000 francs.

A fact, interesting to the antiquary, was elicited on taking out the wooden keys which closed a fissure in the base of this celebrated obelisk, to supply their places with two other keys of copper. They were completely corroded by the action of the air and moisture, and there is every reason to believe that they were inserted when the obelisk was first set up at Thebes; thus shewing that, 4,000 years ago, the Egyptians were acquainted with the powerful means of uniting two pieces of wood, now used, and called dovetailing.

MACHINE FOR GRINDING CAST-IRON PULLEYS.

Mr. Whitelaw has communicated to the Society of Arts for Scotland the description of a grinding machine which is used instead of a turning lathe, for giving a *truly cylindrical* form to the rims of pulleys and drums. He next describes a machine which has never yet been brought into practice, for grinding pulleys, &c. *round* on the rim; and from some experience in working the first machine, Mr. Whitelaw is of opinion that it may be applied to a greater variety of work, and much more extensively than it ever has been; and that grinding machines may be used to great advantage in factories where mill-gearing is made.

The details of this invention will be found in *Jameson's Journal*, No. 50. The Committee of the Society of Arts, to whom this invention has been referred, consider Mr. Whitelaw's communication to be one of very high merit, relating to a subject every day becoming more important.

SIMPLE WATER FILTERS.

The charcoal must be perfectly well burnt, and kept from exposure to the atmosphere; a test of good charcoal is that, when pulverized, it sinks rapidly in water. The charcoal must be supported on an indestructible material, as a plate of burnt clay perforated with holes. The filter may consist of a common garden-pot, or similar vessel, with holes at the bottom. The lower part may be filled with round pebbles, then some smaller pebbles, then some coarse sand, and, finally, a stratum of pounded charcoal, of about three or four inches in thickness. It is a great mistake to put any material, as sand, above the charcoal, with the view of arresting the grosser particles of impurity, as the sand will quickly stop up and be impervious to water. A filter prepared as above directed, will render water perfectly clear and sweet for many years.—*Mr. J. T. Hawkins; Proceedings of the British Association.*

IMPROVED WRITING TABLE.

Mr. Sopwith has devised an improved method of constructing secretaries and writing tables, the principle of which is, that, by opening a single lock, the whole of the drawers, closets, and partitions are opened. These are so disposed, also, as to admit of everything being reached without the person stirring from his seat. They are all entirely closed again by a single spring lock. It would be impossible to convey a clear idea of this ingenious invention without sectional plans and elevations; but one contrivance is peculiarly worth mentioning. Within this case, Mr. Sopwith hangs up his various keys. On any key being removed, a small counterbalance weight, or bolt, drops down, and remains down until the key is replaced. This bolt effectually prevents the closing of the case. If, then, the person should forget to replace the key which has been removed, he is immediately reminded of it, by being unable to close the case. One of the tables was exhibited at the late meeting of the British Association, where its arrangements were much admired by the *savans* present.

Natural Philosophy.

THE CAVENDISH EXPERIMENT.

About three years ago, a committee was appointed by the Royal Astronomical Society, for the purpose of following up the celebrated experiment of Cavendish, for determining the mean density of the earth.* Inadequate funds and other circumstances have, however, from time to time, occasioned delay. At length, Her Majesty's Government, having been satisfied of the importance of the subject, have granted £500 towards defraying the expenses; and the apparatus has been erected at the house of Mr. Francis Baily. These experiments will probably determine whether that governing principle, attraction or gravity, which retains the planets in their orbits, and binds all bodies together, be or be not impressed by the Deity on matter; or whether it be, as Newton supposed, the operation of an extremely subtile fluid pervading all space, which, by its unequal pressure on opposite sides of the particles of matter, causes that tendency called attraction, cohesion, &c. If it should be found that the same body, at different temperatures, attracts another body with different intensities, it will be a proof that gravity is not a property of matter. The experiments are, therefore, to be made under different temperatures, and with different substances. If it should be found, also, that different bodies do not attract in proportion to their weights, this will present another important fact, namely, that action and reaction in gravity are not, as has been supposed, equal. Indeed, it is impossible to anticipate the result of such inquiries. To a discovery of the nature of attraction will, perhaps, be added that of heat, light, magnetism, electricity, &c.; and, probably, a complete revolution in many of our scientific ideas.—*Railway Magazine.*

During the time that the subject has been in agitation in this country, it appears that the same experiment has been undertaken by M.F. Reich, Professor of Natural Philosophy in the *Académie des Mines*, at Freyburg, in Saxony. The method followed by M. Reich was exactly the same as that of Cavendish. The apparatus was erected in a large room under the buildings of the *Académie*, the windows of which were carefully closed, and other precautions taken to preserve an uniform temperature. The torsion-balance, carrying two small leaden balls at the extremities of its arms, was encased in a wooden box, of dimensions just sufficient to allow

* The paper of Cavendish will be found in the Philosophical Transactions for 1798; and "a somewhat detailed account" calculated for popular reading, very opportunely appears in that excellent work, the Companion to the Almanac, 1838.

room for the oscillations. To avoid currents of air, the oscillations were observed by means of a telescope fixed outside the door of the room in which the apparatus was placed, and directed on a mirror attached to the extremity of the arm, and illuminated by a lamp, also placed outside the room. The masses, whose attraction was to be measured, were spheres of lead, weighing forty-five kilogrammes, or 695,061 grains. They were suspended by brass rods to a beam, moveable about a vertical axis; and which, by means of cords and pulleys, the observer, without entering the room, could bring into any required position, with reference to the direction of the arms of the torsion-balance. It was found, however, most convenient to use only one of the spheres. The principal correction required is for the *moment* of the arm of the balance. This was computed by a method similar to that which was employed by Gauss, for determining the *moment of inertia* of his magnetic bars.

Nearly two years were consumed in the necessary preparations; but when completed, M. Reich was enabled to perform the experiments during the three months of June, July, and August, 1837. Each observation required the determination of three quantities: the distance of the centres of the large and small spheres, the time of the oscillations, and the deviation of the arm of the balance. The distance varied from 6·62 to 7·49 inches; the duration of the oscillations, from 6′ 41″ to 6′ 50″; and the deviation from ·236 to ·315 of an inch. The greatest source of error is in the determination of the deviation; the position of the arm being subject to some anomalous variations, caused, probably, by slight currents of air in the interior of the wooden case. This source of error could only be eliminated by increasing the number of observations; but the differences of the partial results actually obtained were so small, that the mean result may be regarded as sufficiently approximate.

The number of observations was fifty-seven. The mean of the whole gives the density equal to 5·44, a result which is almost identical with that of Cavendish. M. Reich also used for the attracting mass a sphere of cast-iron, of the same diameter as the leaden one, and weighing thirty kilogrammes, or 463,373 grains. Five observations with this sphere gave the density = 5·43.

These details were communicated to the Royal Astronomical Society, by the President, Mr. F. Baily, on December 8, 1837; and have been derived from a memoir read by M. Reich, at the German Scientific Association, which met at Prague, in September.

NEW METHOD OF DETERMINING THE LONGITUDE.

On March 8, a paper was read to the Royal Society, proposing "A new Method of determining the Longitude, by an absolute Altitude of the Moon;" by J. C. Bowring, Esq. This method was proposed many years ago by Pingré and Lemmonier, when the principal difficulty in its way was its requiring the exact determination of the moon's declination reduced to the place of observation. This difficulty the author professes to have removed by supposing two meridians, for which the altitudes are to be calculated; and the only requisite is the accurate determination of the latitude, which presents no great difficulty, either on land or at sea. Examples are given of the practical working of this method; shewing that if the latitude of a place of observation be obtained within a few seconds, the longitude will be found by means of a single observation of the altitude of the moon.

RESISTANCE OF FLUIDS TO VESSELS.

ONE of the most important papers submitted to the British Association, at their recent anniversary, was, that by J. S. Russell, Esq., on the above inquiry. Mr. Russell stated that the law of the primary or great wave of translation had been established in their researches of former years; that its velocity did not depend upon the velocity, or upon any movement, of the vessel, nor upon anything but the depth of the fluid. From experiments with various forms of vessels, in former years, the law of resistance appeared to be a proportion to the squares of the velocities; but this is by no means true, and remarkable deviations occur, according to the velocity and depth of the wave. A velocity of four miles an hour, for instance, requires a force, or propelling power, of 100 lbs.; of eight miles an hour, would, according to the law of the squares of the velocities, require a power of 400 lbs.; of twelve, a progressive proportion,—but this is not the case: a velocity of eight miles an hour would require a power of 800 lbs.; whereas, the velocity, of twelve miles would require a power of only 300 lbs.

Thus, a considerable deviation is perceived from the law: to a certain extent, the resistance is increased beyond the square of the velocity, and then diminished greatly in proportion to the velocity. And the law may be thus enunciated. The resistance to the vessel is much greater than the square of the velocity, only so long as its velocity be less than the velocity of the fluid; and, when more, the resistance is much less than the square of the velocity. What then should be the form of the vessel? Mr. Russell has examined the internal mechanism of the wave; how the minute particles behaved themselves, and how motion was propagated. The wave of translation was always *plus*, or positive, above the fluid, and the velocity equal to the body of water falling through half the depth of the channel. The question arose, where would the particles extending to the depth be, when the wave had passed, or at every instant during its passage. These particles move horizontally and vertically, all at the same instant, and with the same velocity; and when the wave has passed over, the particles are all in the same state of rest, each translated from the point where they were, to a point in the direction of the wave. When the crest of the wave comes over these particles, the upper one is found there, describing a semicircle; the particle, at half the depth, describes an ellipse, and the ellipse becomes gradually flattened; so that the lower particle moves in a straight line, from point to point, at the bottom of the channel.

The inquiry into the construction of vessels was pursued thus. How does the vessel act upon the water, and how are the particles moved? And here a remarkable theory was manifested. A vessel passing through water, if we knew the requisite condition, would meet with no resistance at all, or, rather, the resistance of the translation of the fluid would be *nil*. The resistance of the adhesion was a different thing; and the object to be accomplished would be to remove the particles so far as to allow the vessel to pass through, and the particle to return to rest. An analogy was drawn from the law of refraction, the ray passing through the two media. Such is done in a wave; the ordinates of displacement are equal to the ordinates of the wave, forming the curve of least displacement.

In trying different forms of vessels, a singular phenomenon was observed. One moved through the water, at the rate of fifteen miles an hour, without the least disturbance, the water being as smooth as glass behind and before it; and this experimental accidental vessel proved to

be the exact form of the wave of translation, a solid of least resistance and displacement. And, what is more satisfactory, steam vessels built recently, of the same form, enter the water without the least ripple, and progress at eleven or twelve miles the hour without the slightest sensible resistance. Mr. Russell, therefore, trusted that some progress had been made towards the discovery of an irresistible fluid, or, rather, that we invented it with this property by a knowledge of the constitution of the wave. There was, however, a different wave for every velocity; the form of the vessel should, therefore, vary accordingly, and have the figure of the wave at the same velocity to render this discovery of use for practical purposes.—*Literary Gazette.*

The accompanying diagrams will serve to convey a more distinct idea of the nature of the motion of the particles of the water.

FIG. 1.

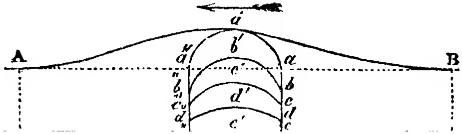


FIG. 2.

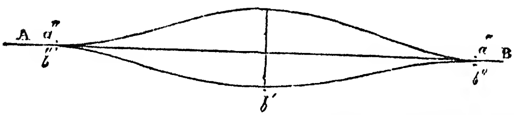


Fig. 1, shews the form of the wave, and the lines of translation of the particles during the transit; A a' B the line of the wave; $a\ a'\ a''$, $b\ b'\ b''$, $c\ c'\ c''$, &c. lines of translation of the particles during the transit.

Fig. 2, shews how the lines of a vessel are to be formed so as to produce a displacement analogous to the displacement of the wave, and so move through the fluid with the least resistance.—*Athenæum.*

THE TIDES.

THE Rev. W. Whewell has communicated to the Royal Society his Ninth Series of Researches "On the Deductions of the Laws of the Tides, from short Observations "

It is very desirable to ascertain whether it is possible to deduce the laws of the tides from short series of observations; since, if it be so, not only does the construction of good tide tables for different places become more easy, but also the value of tide tables is much increased, if the predicted tides agree with those of each year as well as with the mean of many years. The object of the author in this paper is to determine this point by the discussion of several years' observations of the tides at Plymouth and at Bristol.* The calculations for the former place were executed by Mr. Dessiou and Mr. Ross in the Hydrographer's Office at the Admiralty; the calculations for Bristol were performed by Mr. Bunt, in virtue of a grant of money from the British Association. The result

* By these experiments it has been found that the tides in the Bristol Channel, comprised in the space of the East Steep Holmes, constantly keep sus-[illegible] in their waters at least 700,000 tons of mud.—*Hereford Journal.*

of these discussions is, that a very regular form and good approximation for the semi-menstrual inequality may be obtained from the observations of one year; that the existence of the lunar parallax corrections appears very clearly in the observations of one year; and that its value may be determined from a series of three or four years. The lunar declination corrections are more irregularly given by short series of observations; but in a series of four or five years, the general form and approximate value of the corrections become manifest. In the course of these calculations such questions as the following were proposed, and their solution attempted:—1. To which transit of the moon ought we to refer the tide? It appears that the transit which produces the best accordance with theory, is that which Mr. Lubbock terms transit B, which is an epoch about forty-two hours anterior to the high water at Bristol and Plymouth. 2. How does a change of the epoch affect, first, the semi-menstrual inequality; secondly, the parallax correction of the time; thirdly, the declination correction of the times; fourthly, the parallax correction of heights; and fifthly, the declination correction of the heights? 3. Does the parallax correction of height vary as the parallax? 4. Does the parallax correction of time vary as the parallax? 5. Does the declination correction of the heights vary as the square of the declination? 6. Does the declination correction of time vary as the square of the declination? 7. Can the laws of the corrections be deduced from a single year? 8. Are there any regular differences between the corrections of successive years? 9. Do the corrections at different places agree in themselves? It does not appear that any change of the epoch will produce an accordance of the observed laws with the theory, some of the inequalities requiring one epoch for this purpose, and some requiring another. The inequalities in different years and different places are also compared. Mr. Whewell remarks, that since it has now been shewn that good tide tables may be obtained from short series of observations, his researches with regard to the determination of the lunar corrections may be concluded; and the proper mode of farther prosecuting the subject, would be to have tide observations at several stations, each observer reducing its own observations, and thus constantly improving the tables, as is practised in other branches of astronomy.—*Athenæum.*

Mr. Whewell has come to the result, that the mean tide should be taken as the level of the sea. This fact, he said, was not only curious in itself, but was pregnant with important practical consequences; for many errors crept in from calculating the level of the sea at high water; whereas, if the mean tide were adopted as the level, a fortnight's observation, and taking the levels for a few miles inland, would enable persons to take the true levels of places one hundred miles off, for the construction of canals or other public works, without proceeding the whole distance.

CONSTRUCTION OF TIDE TABLES.

THE importance of the results which have been obtained by Mr. Whewell and Mr. Lubbock, in their Researches on the Tides, may be best estimated by the rapid advancement which has been made in our knowledge of the laws which regulate the movements of the tides during the last six years, and which is entirely owing to their joint labours. Theory, though little cultivated and little known, was then in advance of observation; tide tables were constructed by unpublished rules, which formed a profitable possession to those to whom the secret was known,

and the distinctive characters of the tides in the different ports of this kingdom, that of Liverpool perhaps excepted, were confined to the experience and tact of those who were accustomed to use them; but how different is the case at present! The rules for the construction of tide tables are not only public property, but are based upon the most extensive observations: laws, whose existence was hardly suspected, are now distinctly laid down; the progress of the waves in the most frequented parts of the ocean is beginning to be accurately developed: theory, which was formerly in advance of observation, though greatly improved in those parts of it which do not involve the hydrodanymical laws of the ocean, is now greatly behind it; and such a basis of facts has been laid down as may enable the mathematician to commence such a series of investigations as may terminate in enabling another Laplace to give to the theory of the tides a form which may rival, in the certainty of its predictions, the almost perfect theories of physical astronomy.—*Royal Society: Council Report*, 1837.

NEW TIDE GAUGE.

THIS machine, constructed by T. G. Bunt, was erected on the eastern bank of the river Avon, in front of the Hotwell House, Bristol, in 1837. The principal parts are an eight-day clock, which turns a vertical cylinder once in twenty-four hours; a wheel to which an alternate motion is communicated by a float rising and falling with the tide, and connected by a wire with the wheel, which is kept constantly strained by a counterpoise; and a small drum on the same axis with the wheel, which, by a suspending wire, communicates one-eighteenth of the vertical motion of the float to a bar carrying a pencil, which makes a curve on the cylinder, or on a sheet of paper wrapped round it, exhibiting the rise and fall of the tide at each moment of time.—*Proc. Royal Society*.

LEVELS OF THE THAMES.

THE Council of the Royal Society, having deemed it desirable that the difference of level between the brass mark fixed by Capt. Lloyd on the north-east landing-stairs of the New London Bridge, and Mr. Bevan's mark on the basement of the pilasters of the north-east landing-stairs of Waterloo Bridge, should be accurately ascertained, requested Sir John Rennie to undertake this determination. Sir John Rennie has reported to the Council, that, after repeated trials, the greatest variation of which did not exceed two-tenths of an inch, he found that the mark on Waterloo Bridge is three feet and 1·65 inches above that on the New London Bridge.

THEORY OF LIGHT.

ON June 16th, Professor Powell read to the Ashmolean Society, a paper in illustration of the Theory of Light. The only theory which can be proposed, at present, in explanation of a wide range of phenomena, is that of undulations. The preeminent value and importance of the researches of M. Cauchy, and of Messrs. Tovey and Killand, were pointed out; the Professor then exhibited a mechanical invention of his own, to facilitate the primary conceptions of the theory; and, by an extremely simple process, represented to the eye the nature of a wave of light in general; and the relation between plain, circular, and elliptical polarization. The author was of opinion, that Newton did not positively maintain either the undulatory or corpuscular theory; but, in his conjectural

speculations, inclined, in some manner, to the analogies of either theory, stating, however, distinctly the apparent objections to them both.

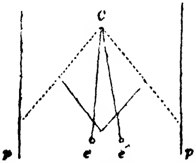
NEW PHENOMENA OF LIGHT.

Sir David Brewster has communicated to the British Association "An Account of an Analogous Series of New Phenomena of Diffraction when produced by a Transparent Diffracting Body." These phenomena, when carefully produced by the various methods which he explained, exhibited a series of splendidly coloured bands of light, sometimes perfectly symmetrical and sometimes unsymmetrical, accordingly as the diffracting body was regular or irregular in its section; and the author remarked, that an instrument could thus be constructed for giving new patterns of ribands of all forms and colours. The theory of the phenomena he considered quite simple and obvious; but he stated that a comparison of the results of theory and experiment would be difficult, from the difficulty of ascertaining the exact form of the diffracting body.

Another paper was communicated to the Association by Sir David Brewster, "On the Combined Action of Grooved Metallic and Transparent Surfaces upon Light." The phenomena described in this paper, discovered by the author, were altogether new and of a very remarkable description. The spectra, produced by the methods which were explained, were covered with bands like those produced by the action of *nitrous gas* upon the spectrum; and the phenomena varied with the distance of the grooves, with the relation of the dark and luminous intervals, and with the inclination of the incident ray. Sir David Brewster described analogous phenomena, and others of a remarkable character, when the grooves were made in *transparent* surfaces; and he explained the manner in which he conceived the phenomena were produced, on the principles of interference—an explanation in which Sir John Herschel expressed his concurrence; adding, "the discoveries of Sir D. Brewster, whether viewed in relation to the intervals at which they succeeded each other or the instruction they conveyed, equally filled us with delight and astonishment."—*Athenæum.*

THE STEREOSCOPE.

This instrument has been contrived by the ingenious Professor Wheatstone, for illustrating the phenomena of binocular vision; and has been submitted to the British Association. It is named from its property of presenting to the mind the perfect resemblance of solid objects. Its construction is explained by the following diagram, in the *Athenæum:* e e' are the two eyes of the observer placed before two plane mirrors, inclined to each other at an angle of 90°; the axes of the eyes converge to a point c; the pictures p p' are so placed on sliding panels, that their reflected images may be adjusted to appear at the place of convergence of the optic axis; it is obvious, then, that the pictures on the retinæ will be precisely the same as if they proceeded from a real object placed at c. In this manner may solid geometrical forms, crystals, flowers, busts, architectural models, &c. be represented with as perfect fidelity as if the objects themselves were before the eyes.



The spectator, by alternately shutting the right and left eye, has visibly and strikingly demonstrated the remarkable phenomena which cause the double image, *i. e.* the image made upon the retina of each eye, to appear as but a single image to the mind. This, which has perplexed metaphysicians, and on which volume upon volume has been written, is rendered clear to the comprehension of childhood, by the easy and obvious experiment of Mr. Wheatstone, and by a contrivance so simple, that, when once seen, any person may construct a copy in an hour.—*Literary Gazette.*

Sir David Brewster considers the above communication to be one of the most valuable optical papers that have been presented to the Section; and Sir John Herschel characterises Mr. Wheatstone's discovery as one of the most curious and beautiful, for its simplicity, in the whole range of experimental optics.

NEW PHENOMENON OF COLOUR IN FLUOR SPAR.

SIR DAVID BREWSTER has observed to the British Association: "In the fluors from Derbyshire, consisting of strata, differently coloured, a beautiful blue colour, different from that which is seen by transmitted light, is most powerfully developed in the purplish, or bluish-brown strata; in a less degree, in the greenish; and still less in those layers which are colourless by transmitted light. In the first of these cases, the blue colour may be distinctly seen when the crystal is held in the common light of day. The colour is still more brilliant in the bright light of the sun, and may be greatly increased by covering part of the crystal with black wax, or by immersing it in a glass trough, covered externally with wax, and containing an oil of nearly the same refractive power as the spar. Fissures within the crystal will much influence the effect of the experiment by reflecting the transmitted light.

To have, however, ocular evidence of the nature, character, and beauty of this experiment, a beam of condensed solar light should be transmitted through the crystal. In the green fluor of Alston Moor, the different shades of blue given out by the exposure to strong light, are not so highly contrasted as in the Derbyshire specimens. The blue colour is reflected from surfaces within the spar; it is not observed in all specimens, nor in every part of the same: wherefore it must be caused by extraneous matter, of a different refractive power from the spar, introduced between the molecules of the crystal during its formation. It cannot be produced by shallow cavities, or minute pores, as in some of the opals, Sir D. B. argued; because the specimens in which it occurs are so perfectly transparent, and because he had observed the same reflected tints in fluids, particularly the juices of plants, extracted by alcohol, and in several artificial glasses. Sir D. Brewster conceived, that the blue tints in fluor spar might be discharged by heat, and might even be connected with the phosphorescence of the mineral. He accordingly exposed two specimens, one of the Alston Moor, and one of the Derbyshire fluor, to a powerful heat. Both emitted a blue phosphorescence similar to the reflected tint, and much of the natural colour of the fragments was discharged. In another experiment with the Alston Moor fluor, the reflected tint appeared to be wholly removed; but in a third, with a specimen of the latter, taken from the solid angle of the cube, the blue tint still appeared, though with an impaired brilliancy. Intense heat may, possibly, altogether destroy the blue tint; but the decrepitation of the mineral by the action of heat, renders it difficult to obtain satisfactory results.

Sir John Herschel was inclined to attribute the phenomenon to irregularity of structure, as it manifested itself in some kinds of liquids. M. Arago had observed to him, with respect to the deep blue colour of the Lake of Geneva, that he was induced to attribute it to some such internal structure as was to be seen in specimens of fluor spar.

PREPARATIONS OF THE EYE.

SIR DAVID BREWSTER has laid before the British Association a series of beautiful preparations of the eye, made by Mr. Clay Wallace, an able oculist, in New York; calculated to establish some important points in the theory of vision. Mr. Wallace considers that the eye is adjusted to different distances, in two ways:—in eyes which have *spherical lenses* it is produced by a *falciform* or hook-shaped muscle, attached only to one side of the lens, which, by its construction, brings the crystaline lens nearer the retina. In this case, it is obvious that the lens will have a slight motion of rotation, and that the diameter, which was in the axis of vision previous to the contraction of the muscle, will be moved out of that axis after the adjustment, so that at different distances of the lens from the retina different diameters of it will be placed in the axis of vision. As the diameters of a sphere are all equal and similar, Mr. Wallace considers that vision would be equally perfect along the different diameters of the lens, brought by a rotation into the axis of vision. Sir David Brewster, however, remarks, that he has never found among his numerous examinations of the lenses of fishes any which are perfectly spherical, as they were all either *oblate* or *prolate* spheroids, so that along the different diameters of the solid lens the vision would not be similarly performed. But, independent of this circumstance, he states, that in every solid lens there is only one line or axis in which vision can be perfectly distinct; namely, the axis of the optical figure, or series of *positive* and *negative* luminous sectors, which are seen by the analysis of polarized light. Along every other diameter, the optical action of the lens is not symmetrical. When the lens is not a *sphere*, but *lenticular*, as in the human eye, or in the eyes of most quadrupeds, Mr. Wallace considers that the apparatus for adjustment is the ciliary processes, to which this office had been previously ascribed, though not on the same scientific grounds as those discovered by Mr. Wallace. One of the most important results of his dissections is the discovery of *fibres in the retina*. These fibres may be rendered distinctly visible. They diverge from the base of the optic nerve, and surround the *foramen ovale* of Soemmering at the extremity of the eye. Sir John Herschel supposed such fibres to be requisite in the explanation of the theory of vision; and it is, therefore, doubly interesting to find that they have been actually discovered.—*Athenæum.*

STRUCTURE OF THE EYE OF A SHARK.

SIR JOHN HERSCHEL relates to the British Association: While crossing the Atlantic, on my return from the Cape, on the 31st of March of the present year, in lat. about 2° N., lon. about 20° W., we caught a shark. Having procured the eyes, which were very large, and extracted the crystaline lenses, the vitreous humour of each, in its capsule, presented the usual appearance of a very clear, transparent, gelatinous mass, of little consistency, but yet forming, very distinctly, a connected and continuous body, easily separable from every other part. Wishing to examine it more narrowly, it was laid to drain on blotting-paper; and, as this grew saturated, more was applied, till it became apparent that the

supply of watery liquid was much too great to be accounted for by adhering water or aqueous humour. Becoming curious to know to what extent the drainage might go, and expecting to find that, by carrying it to its limit, a gelatinous principle of much higher consistency might be insulated, I pierced it in various directions with a pointed instrument. At every thrust, a flow of liquid, somewhat ropy, but decidedly not gelatinous, emanated ; and, by suspending it on a fork, and stabbing it in all directions with another, this liquid flowed so abundantly, as led me to conclude that the gelatinous appearance of this humour, in its natural state, is a mere illusion, and that, in fact, it consisted of a liquid no way gelatinous, inclosed in a structure of transparent, and, consequently, invisible cells. The vitreous humour of the other eye, insulated as far as possible, was therefore placed in a saucer, and beaten up with a fork in the manner of an egg beaten up for culinary purposes. By this operation, the whole was resolved into a clear watery liquid, in which delicate membraneous flocks could be perceived, and drawn out from the water in thready filaments on the end of the fork. From this experiment, it is clear, that the vitreous humour (so called) of this fish is no jelly, but simply a clear liquid, inclosed in some close cellular structure of transparent membraneous bags, which, by their obstruction to the free movements of the contained liquid, imitate the gelatinous state. Sir D. Brewster observed, that he had frequently found the vitreous humours of fishes' eyes to exhibit the greatest variety of colour—green, rose-pink, &c.—*Ib.*

OCULAR PARALLAX IN VISION, AND LAW OF VISIBLE DIRECTION.

THE existence of an ocular parallax, which is the measure of the deviation of the visible from the real direction of objects, has been experimentally proved by Sir David Brewster. Assuming that the cornea and bottom of the retina have the same centre of curvature, which is correct, the line of visible direction would coincide with the line of real direction, if there were no crystaline lens. Minute deviations, however, are caused by the refraction on the surfaces of the crystaline, although, at an inclination of 30° to the axis the deviation is no more than half a degree, a quantity too small to interfere with the purposes of vision. At a greater inclination, the deviation increases; but as the vision out of the axis is not distinct, and, as the distinctness increases according to the inclination of the incident ray, such deviation cannot be ascertained by ordinary observation: hence, Sir D. Brewster says, the mechanical principle of D'Alembert, and the law of Dr. Reid, are substantially true. The eye, however, has not the property of seeing visible points in their real directions.—*Proc. Brit. Assoc.: Literary Gazette.*

NEW OPTICAL INSTRUMENT.

ON April 9, Professor M'Cullagh exhibited and described to the Royal Irish Academy, a new optical instrument, intended chiefly for the purpose of making experiments on the light reflected by metals. The instrument consists of two hollow arms or tubes, moveable about the centre, and in the plane, of a large divided circle, each arm being provided with a Nicol's eye-piece, or some equivalent contrivance for polarizing light in a single plane; while in one arm, which is, of course, crooked, a Fresnel's rhomb is interposed between the eye-piece and the centre of the circle. At this centre is placed a stage for carrying the reflector, with its plane perpendicular to the plane of the circle, and having

a motion to and fro for adjustment. Each eye-piece, as well as the Fresnel's rhomb, turns freely about the axis of the arm to which it belongs, and is provided with a small circle for measuring its angle of rotation. When the two arms are set at equal angles with the reflector, and the observer looks through the crooked arm, he will see a light admitted through the straight one; and then, by turning the Fresnel's rhomb, and the eye-piece next his eye, he will be able, by means of their confined movements, to find a position in which the light will entirely disappear. An observation will then have been made; for the light, before its incidence on the metal, is polarized in a given plane by the first eye-piece; but after reflection from the metal (as we know from Sir David Brewster's experiments), it is elliptically polarized; and our object is to determine the *position* and *species* of the little ellipse in which the reflected vibration is supposed to be performed. Now, the axes of this ellipse are parallel and perpendicular to the principal plane of the rhomb, when it is in the situation above described, where the light completely disappears; and the ratio of the axis is the tangent of the angle which that plane makes with the principal section of the eye-piece next the eye. The angles are read off from the divided circles; and thus, for any angle of incidence, and any plane of primitive polarization, we can at once ascertain the nature of the reflected elliptic vibration.—*Athenæum.*

LUMINOSITY OF THE HUMAN BODY AFTER DEATH.

MESSRS. D. and R. COOPER have communicated to the *Philosophical Magazine,* No. 76, an interesting paper upon the novel fact of the phosphorescent or luminous appearance of the human subject. They are fully aware of its occurrence in many of the lower, and even of the higher classes of animals, but not of any fact similar to the present having been heretofore recorded.

This remarkable property was first observed in the left leg of a body received for dissection at the Webb-School of Anatomy and Medicine, Borough; the leg having been removed, according to custom, at the upper third of the thigh. The deceased was a hard-working man, aged 88, and had died of age and debility. Not having been informed of the phenomenon until the body and limb had been dispatched for interment, the Messrs. Cooper had not the opportunity of experimenting with regard to the cause. A few nights after, another body was observed to be similarly affected, and found to be inoculated with the matter from the first subject. The Messrs. Cooper were enabled to remove it with their fingers, to which it gave a luminous appearance; and, although removed from the right knee by continual scraping, it seemed to extend into the substance of the bones.

Upon submitting this luminous matter to a microscope with a lens of about 900 power, the light evolved was sufficient to illuminate the field in patches. The luminosity appeared to be emitted from an *oily matter,* and not from extremely minute animals as was at first supposed; although the molecules seen were estimated at the 100,000th of an inch in size, or so small that it was impossible to measure them with the finest micrometer yet constructed.

The phosphorescence was extinguished in two minutes by immersion in chlorine and sulphuretted hydrogen; thus inducing the experimenters to disagree with the conclusions of Macartney and Murray, as regards the non-disappearance of the phosphorescent light emitted from animals when immersed in gases. The light almost entirely disappeard *in vacuo,*

but its brilliancy was visibly increased in condensed air. Its appearance in water, milk, oil, and alcohol, the diluted mineral and vegetable acids and alkalies, are then noted; and from the results, the Messrs. Cooper believe this phenomenon to be the effect of a *peculiar state* of decomposition, totally independent of atmospheric causes, the luminosity residing in the *oily matter* shewn by the microscopic examination.

COLOUR OF THE NEGRO.

Mr. R. M. Glover has read to the British Association a paper "On the Functions of the Rete Mucosum and Pigmentum Nigrum in the dark races, and particularly in the Negro."

The degree of development of the rete mucosum and its pigment, determines the power of resisting the excessive heat of the sun in tropical climates, as evinced by the negro (the type, in this respect, of the dark races), the European and the Albino. The *modus operandi* must be discovered by an attention to both the physical and vital properties of this peculiar organization. The doctrine at present taught on the subject, is, that the black skin absorbs more heat, but that the cutis vera of the negro is not so liable to inflammation from a high temperature as that of a European from a lower temperature; and as the radiation of caloric from black must be greater than from white skins, the possessor of the former must cool more readily, and enjoy greater alternations of heat and cold. The former part of this doctrine is founded on the experiments and deductions of Sir Everard Home, as detailed in his paper in the Philosophical Transactions. A number of experiments detailed in the paper on the vesicatory powers of differently coloured substances, under the concentrated rays of the sun, contradicted the deductions of Sir E. Home, and hence arose the necessity of looking to the vital properties of the skin of the negro, and the mode in which it is likely to be affected by the radiating and absorbing power of the pigment with which he is provided. Blumenbach and Winterbottom state, that the negro perspires more readily and freely than the European; and Davy says, "In the inhabitants of the tropics, the exhalent arteries of the skin seem unusually expanded, and the whole apparatus peculiar to this secretion unusually developed; and I believe that the blood itself is less viscid, more fluid, and flows more readily through the vessels, so as to promote perspiration, and by that means, contributing to the cooling of the surface. And being cooled itself, it contributes again, when it flows back upon the heart, to the reduction of the temperature of the internal parts." Were the inhabitant of the tropics not possessed of this peculiar organization, his system could not respond to the stimulus of heat, by a determination of fluid towards the surface. Doubtless, the excessive absorption of heat by his skin, is useful in promoting this effect; but in the system qualified to respond to the stimulus of heat, and not in the organization of the skin alone, must an explanation be sought of the capability of the negro to withstand the heat of the tropical regions.

EXTRAORDINARY MEMORY.

In July, the remarkable youth, Gustave Adolphe Bassle, from the Hague, aged about twelve years, attended by his father, Chevalier Bassle, was introduced to his Royal Highness the Duke of Sussex: he was accompanied by the Sicilian youth, Mangiamele; and several distinguished members of the Royal Society were present. With ease and exactness

Gustave Bassle answered a number of difficult miscellaneous questions in French, Dutch, German, and English. The other youth, Mangiamele, exhibited also great powers when his attention was directed to difficult questions in cubic equations, and other matters of a like complicated nature; but his idea of calculation was of purely natural and simple algebraic and arithmetical properties; he had no idea of the negative roots of quadratic or cubic questions. The opinion of some distinguished mathematicians present was, that his mathematical talent fell far short of that of George Bidder and Zera Colbern, though they admitted it to be very great. The qualities of these lads, however, cannot admit of a fair comparison. In the present case, the talent of each youth was peculiar: that of Gustave Adolphe Bassle may be termed an ambulatory encyclopædist's; that of Mangiamele a mental algebraist's. The success of the former depended upon an effort of memory; that of the latter, on the faculty of arrangement and the perception of locality. His Royal Highness having intimated a wish that Mr. Deville, the phrenologist, should attend, without apprising him of the object of the requisition, or the qualifications and talents of the parties to be examined. Mr. Deville described the organization and faculties of both youths, which was considered a highly curious, and, as far as the company had the means of judging of it, a very correct, illustration of Mr. Deville's discriminative talent. Mr. Deville then shewed to His Royal Highness what was considered a far greater curiosity, the profiles of the bust of Zera Colbern, the celebrated American calculator, at various periods of life, exemplifying the development and changes of the external form of the brain, consequent on improved education and association with intellectual persons, under circumstances favourable to the enlargement of the higher moral faculties. Gustave Bassle first gave the relation of the circumference to the diameter of a circle, considered as unity, to 155 figures, without one fault. After which the persons present demanded, at pleasure, the 35th, 98th, 73rd, 140th, and 106th figures, and so forth, which he told almost instantly, without hesitation. He was then asked the specific gravity of various substances; of ivory, silver, ether, &c., to which he gave answers with equal dispatch and readiness; the dates of remarkable epochs; the distances of Saturn, of Mars, their proper movements, relative masses with respect to the earth, &c.; the whole of the possible moves of the knight and other pieces at chess; various portions of poetry; and a number of interesting matters connected with sacred and profane history, geography, and science.—*Abridged from the Courier.*

On July 21, Bassle lectured at the Royal Institution, and submitted to the audience, programmes, containing answers to upwards of 20,000 questions, by which each individual present could be satisfied of the correctness of Bassle's replies, and the extraordinary accuracy of his mnemonical system. The questions in history, geography, cosmography, mythology, chemistry, natural history, inventions and discoveries, natural philosophy, &c., were put to him by the visitors, in English, French, and German; however rapid, however varied, he evinced no hesitation, no confusion, and his answers were prompt and correct. The following shews the extent of the mechanical, methodical memory which has been acquired by Master Bassle, aged twelve years, and may be acquired by any one. He named the day of the week on which fell the first of January, from the commencement of the Christian era till the adoption of the Gregorian calendar; the same from that time till the year 2,400, or to the most remote period; and the same for any day of the month, in any year,

whether common, or bissextile. He repeated the numbers, denoting the proportion of the circumference to the diameter, to the 154th place of decimals, backwards, forwards, or in any order; and gave the figure accompanying any piece taken at random.—*Literary Gazette.*

CORAL ISLES.

MR. DARWIN, who accompanied Captain Fitzroy, as naturalist, in his recent expedition in H.M.S. Beagle, entertains the following new views respecting the history of coral isles. Those vast tracts of the Pacific which contain, along with small portions of scattered land, innumerable long reefs and small circles of coral, have hitherto been full of problems, of which no satisfactory solution could be found. For how could we explain the strange forms of these reefs; their long and winding lines; their parallelism to the shores? and by what means did the animals, which can only work near the surface, build up a fabric which has its foundations in the deepest abysses of the ocean? To these questions Mr. Darwin replies, that "all these circumstances, the linear or annular form, their reference to the boundary of the land, the clusters of little islands occupying so small a portion of the sea, and, above all, the existence of the solid coral at the bottom of deep seas, point out to us that the bottom of the sea has descended slowly and gradually, carrying with it both land and corals; while the animals of the latter are constantly employed in building to the surface, and thus mark the shores of submerged lands, of which the summits may or may not remain extant above the waters." Mr. Darwin explains "how corals, which, when the level is permanent, fringe the shore to the depth of twenty fathoms, as the land gradually sinks, become successively encircling reefs at a distance from the shore; or barrier reefs at a still greater distance and depth; or, when the circuit is small, lagoon-islands:—how, again, the same corals, when the land rises, are carried into elevated situations, where they remain as evidences of the elevation." Mr. Darwin has, upon evidence of this kind, divided, in a map, the surface of the Southern Pacific and Indian Oceans into vast bands of alternate elevation and depression: "we have seen the remarkable confirmation of his views in the observation that active volcanoes occur only in the areas of elevation;" and the author has presented this subject under an aspect which cannot but have the most powerful influence on the speculations concerning the history of our globe.—*The Rev. Mr. Whewell's Address to the Geological Society, February,* 1838.

CAUSE OF THE SPEEDY MELTING OF SNOW AROUND PLANTS.

IN a late number of the Annals of Science of Lombardy, are some extended remarks concerning the greater or less rapidity of the melting of snow in the country, according to its position, as around trees and bushes, or in open fields, under long herbage, or where dry leaves and other bodies may be placed immediately over it, or suspended at a certain distance above it. The author of these observations, M. Ambroise Fusinieri, alleges that many of the phenomena are quite opposed to the consequence which should result from the laws of radiated heat, as understood by philosophers. To this objection, M. Melloni replies:*—"This opinion may, perhaps, be true, if the results of my experiments

* Bibliotheque Universelle, June, 1838, translated in Jameson's Journal, No. 50.

upon the different kinds of heat are disregarded; but, if these be adopted, the objections of M. Fusinieri fall to the ground of themselves, and the application of the observed phenomena becomes nothing more than a simple and pure application of the properties of radiated heat as now established."

In replying to M. Fusinieri, M. Melloni observes, "Nothing is easier than to prove that the cause which produces this speedy solution is not a heat which is peculiar to the plants in their living state, for precisely the same phenomena are observed around poles and stakes which are fixed in the ground. Snow is melted by the action of branches and twigs which are situated above it. Other circumstances being equal, this action is greater in proportion as the twigs and branches are more numerous and slender. It commences at noon, and then progressively extends to the west and to the east, and, finally, reaches to the lateral portions of the snow which are situated to the north of the tree. Hence it may be deduced, that the principal cause of the phenomenon arises from the solar heat which is directly communicated to the trunks and branches of trees, and thence radiated upon the surrounding snow.

"And now, the great objection of M. Fusinieri occurs. How is it possible, says he, that a body heated by the influence of radiated caloric can produce a greater effect than the direct rays themselves? the heat emitted by the plants must be much less in intensity than the solar heat itself. But, if the events occur as is usually supposed, the very contrary of what we observe should happen, so that, in open places, *where only the shadows projected by trees and bushes are thrown*, the snow should disappear more speedily than *in spots completely overshadowed by plants;* and we should no longer have the scientific discrepancy of observing the greatest effect where the cause is least. The explanation, therefore, adds M. Fusinieri, of these facts, by the ordinary theory of radiated caloric, cannot be admitted.

"I allow that the melting of snow under the action of radiating caloric ought to increase in proportion to the energy of the incident rays. I also allow that the direct heat of the sun ought greatly to surpass in intensity the heat which emanates from branches and trunks of trees, which are only heated by its influence. But, in maintaining that, in the observed phenomena, the effect is, so to speak, in the inverse ratio of the cause, it would be previously necessary to prove that snow, with equal facility, absorbs the direct solar rays, and those which are emitted by the heated bodies of plants. Else, if these latter rays are much more readily absorbed than the former, there will be no manner of contradiction, and the less action of the more intense rays will be only a natural consequence of their less ready absorption. The error of M. Fusinieri arises from this circumstance: that he still admits, with Leslie and Rumford, a uniformity in the absorbing power of bodies for all kinds of radiating heat, whilst our experiments have demonstrated that these powers are liable to very great changes, when we vary the quality of the calorific rays."

M. Melloni then details some experiments with a thermo-electric pile and galvanometer; from which he concludes, "that the speedy melting of snow around plants, instead of being found in opposition to the existing theories of radiated heat, as M. Fusinieri alleges, is, on the contrary, only a very simple consequence of it."

The more minute details of the phenomenon, M. Melloni considers to be easily explicable, when we start from the principal fact, and take

some accessory circumstances into account. "If, for example, it be demanded, why, beyond the power of the solar rays, the elevated temperature of the air contributes to accelerate the speedier melting of the snow around trees and solid bodies generally, standing in a plain, the cause is easily found in the obstruction which these bodies offer to the direct radiation from the snow towards the celestial space; this maintains them near the temperature of fusion; whilst the snow which is lying in exposed places is cooled down many degrees below zero, in virtue of nocturnal radiation; and is, consequently, much less disposed to melt under the action of the ambient medium. With the same facility we may explain why the influence of plants is still conspicuous when the sky is entirely covered with clouds, and the temperature of the air below zero; for the diffused heat of the sun possesses absolutely the same properties of transmission and absorption, as the direct heat, and ought, consequently, to produce effects wholly similar, so far as the intensity is concerned.

"In considering the action of prolonged calorific radiation upon a series of bodies endowed with the same absorbing powers, it will be seen that those which possess a smaller mass of matter should be heated more speedily than the others, and arrive at that degree of heat which the state of the surface, the power of the incident rays, and the pressure and temperature of the air, will allow; and upon reflecting that the influence of solar heat, whether direct or diffuse, continues during the whole day, we here discover the cause of the greater or less degrees of melting which are produced around stakes, &c. of different sizes; and which, far from being in proportion to the mass of matter, as would occur if these substances were heated to the same temperature previous to their being implanted in the snow, follow, on the other hand, within certain limits, the inverse ratio of the diameters."

PROBABLE DURATION OF HUMAN LIFE.

DR. CASPAR, of Berlin, in his valuable work, "Der wahrscheinliche Lebensdaur des Meuschen," &c., after having examined the current opinions on the average duration of human life, and as to the most satisfactory method of ascertaining such a result, concludes by embodying the general principles of his researches as follows:—

1. The proportion of births to the actual stationary population of any place, expresses, or is relative to, the medium duration of life in that population. (For example, suppose this proportion to be in the ratio of one to twenty-eight, and the average life of the inhabitants of the place will be found to be twenty-eight years.)

2. The female sex enjoys, at every period of life, except at puberty, (at which epoch the mortality is rather greater among young females), a greater longevity than the male sex.

3. Pregnancy and labour occasion, indeed, a considerable loss of life; but this loss disappears, or is lost, in the general mass.

4. The so-called climacteric periods of life do not seem to have any influence on the longevity of either sex.

5. The medium duration of life, at the present time, is in Russia about twenty-one years; in Prussia, twenty-nine; in Switzerland, thirty-four; in France, thirty-six; in Belgium, thirty-six; and in England, thirty-eight years.

6. The medium duration of life has, in recent times, increased very greatly in most cities of Europe.

7. In reference to the influence of professions or occupations on life, it seems that ecclesiastics are, on the whole, the longest, and medical men are the shortest, livers; military men are nearly between the two extremes; but yet, proportionally, they, more frequently than others, reach very advanced years.

8. The mortality is generally greater in manufacturing than in agricultural districts.

9. Marriage is decidedly favourable to longevity.

10. The mortality among the poor is always greater than among the wealthier classes.

11. The mortality in a population appears to be always proportionate to its fecundity: as the number of births increases, so does the number of deaths at the same time.—*Medico-Chirurgical Review.*

LAWS OF VITAL AND PHYSICAL PHENOMENA.

Mr. W. B. Carpenter, M. R. C. S. has communicated to *Jameson's Journal*, a portion of the essay "On the Differences of the Laws regulating Vital and Physical Phenomena," for which he has received the prize annually raised by the contributions of the students, and awarded by the Professors of the University of Edinburgh. This paper is an elaborate contribution to science; and, of its masterly arguments, the following are general conclusions:—

1. That the *properties* of any aggregation of matter depend upon the method in which its ultimate molecules are combined and arranged.

2. That the simplicity of our notion of the properties of inorganic matter depends upon the facility of our becoming acquainted with them through the command which we possess over the agencies by whose operation they are manifested.

3. That the vital properties of organized tissues are not less the result of their material constitution; but that, whilst the *materials* of an organized tissue may be prepared by the operation of the ordinary laws of affinity, acting under peculiar conditions, the tissue cannot be constructed without the agency of a previously existing vitality; and that hence man is debarred from the most advantageous means of becoming acquainted with the laws of physiology.

4. That *vital properties* are not *added* to matter in the process of organization; but those previously existing, and hitherto inactive, are called out or developed.

CAUSE OF PHOSPHORESCENCE.

In glow-worms (*Lampyris*) and the infusoria, we are ignorant whence the phosphorescence proceeds, and if it be owing to electricity. M. Ehrenberg has, however, lately experimented with the light emitted in darkness by the infusoria and the annelides, which make the ocean luminous in certain countries, especially when its surface is agitated by a gentle breeze. Having placed on the object-glass of his microscope, water containing these animalcula, he perceived that the diffuse glimmer which surrounded them was nothing else than a collection of a vast number of small sparks which came from every part of their bodies, and particularly from the bodies of the annelides. These sparks succeeded each other with such rapidity, and had such a resemblance to those observed in common electrical discharges, that M. Ehrenberg concludes them to be identical. He has also satisfied himself that the light emitted is not owing to a particular secretion, but solely to a voluntary act of the animalcule; and that it shews itself as

often as it is irritated by mechanical or chemical means, that is to say, by agitating the water, or throwing either alcohol or acid into it. This is an additional analogy with the torpedo, which only gives a discharge when it is irritated. In the animalcula, as in the torpedo, it is also observed that the discharge recommences after a certain time of repose. From this similarity of effects, in the same circumstances, may we not infer an identity as to the causes? Now, in the torpedo, it is already known, and no one longer doubts it is electricity; and hence we must admit that electricity is also the cause of the phosphorescence of the infusoria and annelides. It is sufficiently remakable that the luminous or other phenomena which depend upon electricity are so much the stronger in proportion as the animals are smaller; and it would appear that this profusion of the electric fluid, which is emitted only by beings of an inferior order, is destined to discharge other functions in beings of a higher order.—*M. Becquerel; Jameson's Journal.**

CAUSE AND EFFECT OF VINOUS FERMENTATION.

M. M. Thaccard, Becquerel, and Turpin, have submitted to the French Academy of Sciences, a Report of M. Cagniard Latour's Researches upon Vinous Fermentation, which have occupied him for more than twenty-five years; and, who, by bringing new instruments to bear upon his investigation, more especially the microscope, has obtained very remarkable results.

The microscopic analysis of *beer-ferment*, or *yeast*, which in chemistry is regarded as a simple substance, has convinced M. Cagniard Latour that this paste, though apparently simple, is a multitude of globular or slightly oval particles, which are vesicular, transparent, and full of smaller globules, the largest reaching to the size of about the hundredth part of a millimetre, or the three-millionth part of an English inch, without motion, and consequently, vegetable in their nature, according to our most approved definitions.

The Report then details a series of microscopic observations made during the night in the English brewery of M. Leperdriel, on a vat containing about 260 gallons of the wort of porter. Among the principal results, M. Latour remarked a difference between the appearance of the simple globules of the yeast and those which were developed during the act of fermentation; these latter, as being younger than the former, appearing more opaque and cloudy. He also noticed, but only on two occasions, that the globules emitted, by a kind of explosion, a remarkably fine powder.

M. Latour thinks that he has perceived that the globules, whilst agitated in the wort, diminish in size, and by such contraction, emit, in the liquid space, small seeds *(seminules)* or reproductive bodies, which, after having vegetated and attained the diameter of the original globule, develope themselves in the way of successive buds, and of so producing minute moniliform vegetables. Thus, the author admits two distinct methods in the reproduction and multiplication of the minute vegetable in beer-ferment,—both that by small seeds, and that by germination or budding; an observation the more interesting, as it is in perfect keeping with the two-fold mode of reproduction of all the simple microscopic vegetables situated at the limit of the scale of vegetation.

In reply to certain questions about the vegetable or animal nature of the globules of yeast, the reporters observe that these organized productions being neither common esculents, nor mammiferous animals, can be

* See also page 102 of the present volume.

distinguished only by what they themselves really are, isolated in nature, and without regarding our conventional character of vegetables and animals. It would have been more suitable to have said, *yeast is not* a simple substance, or chemical product, as has been thought. What appears a dry and soft paste (by aid of the microscope, without the use of which we can no longer speak of any body with confidence), is an agglomeration of vesicular globules without locomotive power, organized, because susceptible of absorption, assimilation, and increase, by the addition of joints, and finally, of reproducing and multiplying themselves; in short, according to the prevailing opinions,—a vegetable.

M. Latour next proceeds to some observations which are purely chemical; remarking, 1st. That yeast acting upon sugar loses its nitrogen, as is generally known; 2nd. That all vegetables in a rudimentary state yield ammonia directly upon distillation. He then insists upon the production or augmentation of the yeast, which, for each vat, yields about seven times the quantity put into the wort. This increase, which might be supposed to proceed from a precipitation of the vegetable albumen, M. Latour, according to his observations, simply and positively accounts for by the multiplication of globules, as above explained, and the number of which agrees well with the augmentation of the weight.

As a proof of the vegetable organization of the globules of the yeast, the author recals to our memory, that this yeast quickly and properly dried may, like a great many seeds, be preserved for a very long time; and is after this susceptible, when placed in favouring circumstances, as in sugar and water, of germination, vegetation, and the production of vinous fermentation. This happens, even when it has been exposed to a temperature so low as 60° Cent. or below zero, Fahr. M. Latour thus closes his memoir:—" All those who are concerned with fermentation on a great scale, as brewers, distillers, &c. know that, in spite of all the care they can bestow, the result is always very variable. This very irregularity favours the hypothesis, that vinous fermentation is excited by a substance which is endowed with vitality; for who does not know in how many different ways such substances may be affected."

M. Latour's discovery merits the most detailed examination. " We have personally," say the reporters, " submitted to this examination with the greater interest, because, from the commencement, we have recognised the truth of the facts announced by the author, and the vast importance of their application to physics, chemistry, physiology, and domestic economy."—*Abridged from an excerpt from the Report, translated in Jameson's Journal.*

ANNULAR LENS FOR A DIOPTRIC LIGHT AT KIRCALDY HARBOUR.

On April 25, was read before the Edinburgh Society of Arts, the Report of a Committee on the Annular Lens of the newly-erected Dioptric Light, at Kircaldy Harbour, by Edward Sang, Esq. Civil Engineer, Edinburgh.

The Report states: " Mr. Sang's invention of grinding annular surfaces of any form by means of cutters attached to a moveable arm, whose end is guided by a spring uncoiling itself from the evolute of the curve-surface which the lens requires, is novel and ingenious, and if equally applicable to the construction of instruments requiring great accuracy of form, promises to be extensively useful. The mode of giving any required direction to the scratches, or small indentations made in the process of grinding, is very simple, and consists partly in reversing the motion

of the cutter, or of the chuck on which the lens is placed, and partly in altering the ratio of the velocities of the surfaces in contact. Any degree of obliquity in the direction of these scratches may, in this way, be produced, both from right to left and from left to right, and thus every possible variety in their direction must be the result. So that the whole effect ordinarily produced by crossing the motions in the usual grinding process, may be obtained. One would, therefore, be induced to expect great accuracy from this method; and Mr. Sang has certainly succeeded in giving to the Kircaldy apparatus a very fine polish, which is a matter of great importance. We consider Mr. Sang's labours as important in regard to the manufacture of lighthouse apparatus, and as calculated to improve the manufacture of refracting instruments generally."

The details of this ingenious improvement will be found in *Jameson's Journal*, No. 50, in a paper, at the close of which Mr. Sang points out a mistake into which M. Fresnel has fallen with regard to the reflective rings employed by him. He places the focus of both the refracting and reflecting system at the lower part of the bright flame; whereas the focus of the refractors only ought to be at the bottom, and the focus of the reflectors at the top, of the flame.

CALORIC BY FRICTION.

M. BECQUEREL, President of the French Academy of Sciences, for 1838, read, on August 13, the Summary of some New Inquiries concerning the Disengagement of Caloric by Friction.

When two bodies are rubbed against each other, heat and electricity are disengaged. Are these effects, which are concomitant, also dependant on each other?

All that we know concerning the production of heat by the mutual friction of two bodies may be reduced to this: the two bodies become hot, and the quantity of heat emitted is sometimes such that it is sufficient to set combustible bodies on fire. Thus it is that a wheel turning rapidly on the axle-tree takes fire; and that many savages, with an address and dexterity which we do not possess, succeed in lighting pieces of wood by rubbing them against each other with astonishing rapidity. Every thing leads to the conclusion that the effect thus produced is owing to the vibratory motion produced by the rubbing upon the atoms, and the following facts go to prove this supposition.

When an alloy of one part of iron and two parts of antimony is subject to the action of a file, bright sparks are immediately produced, which proves that the temperature is raised above incandescence. The percussion of flint and steel proves a similar effect. M. de Rumford, in boring a cannon placed vertically, found so much heat produced, that he thereby boiled water in a small cavity, which was favourably situated. This, then, is nearly all we know concerning the disengagement of caloric through the agency of friction; and thus it would appear that we are completely ignorant of the part which each of the bodies plays in the production of the phenomenon, both as it respects its inherent nature, and the state of its surface.

After adverting to the extreme difficulty of the inquiry, on account of the common thermometers not instantaneously indicating the transmission of the caloric from one body to another, M. Becquerel explains: "the apparatus with which these effects were observed, consists of a thermo-electrical pile, having an excellent multiplicator. Such is its sensitiveness, that the difference of about a hundredth part of a degree,

Electrical Science.

FARADAY'S EXPERIMENTAL RESEARCHES IN ELECTRICITY.

PROFESSOR FARADAY, with untiring industry, which has few parallels in the records of modern science, has continued his valuable Researches in Electricity during the Royal Society's season of the past year.

On Jan. 11, the reading of the *Eleventh Series* was concluded. The object of this paper is to establish two general principles relating to the theory of electricity, which appear to be of great importance, first,—that induction is, in all cases, the result of the action of contiguous particles; and secondly, that different insulators have different inductive capacities.

The author's several experiments are too elaborate for quotation. In conclusion, he remarks, that induction appears to be essentially an action of contiguous particles, through the intermediation of which the electric force originating or appearing at a certain place, is propagated to or sustained at a distance; appearing there as a force of the same kind and exactly equal in amount, but opposite in its direction and tendencies. Induction requires no sensible thickness in the conductors which may be used to limit its extent; for an uninsulated leaf of gold may be made very highly positive on one surface, and as highly negative on the other, without the least interference of the two states, as long as the induction continues. But with regard to dielectrics, or insulating media, the results are very different; for their thickness has an immediate and important influence on the degree of induction. As to their quality, though all gases and vapours are alike, whatever be their state, amongst solid bodies and between them and gases, there are differences which prove the existence of specific inductive capacities.

The author also refers to a transverse force with which the direct inductive force is accompanied. The experimental proof of the existence of such a force in all cases of induction, is, from its bearing on the phenomena of electro-magnetism, and magneto-electricity, of the highest importance.

On March 1, the *Twelfth Series* of these Experiments was concluded; its object being to examine how far the principal general facts in electricity are explicable on the above theory. The operation of a body charged with electricity, if either of the positive or negative kind, on other bodies in its vicinity, as long as it retains the whole of its charge may be regarded as *simple induction*, in contra-distinction to the effects which follow the destruction of this statical equilibrium, and imply a transit of the electric forces from the charged body to those at a distance, which comprehend the phenomena of the *electric discharge*. Having

considered, in the former paper, the process by which the former condition is established, and which consists in the successive polarization of series of contiguous particles of the interposed insulating dielectric; the author here proceeds to trace the process, which, taking place consequently on simple induction, terminates in that sudden and often violent interchange of elective forces constituting *disruption*, or the electric discharge. He investigates, by the application of his theory, the gradual steps of transition which may be traced between perfect insulation on the one hand, and perfect conduction on the other, derived from the varied degrees of specific electric relations subsisting among the particular substances interposed in the circuit; and from this train of reasoning he deduces the conclusion that *induction* and *conduction* not only depend essentially on the same principle, but that they may be regarded as being of the same nature, and as differing merely in degree.

On April 5, the reading of the *Thirteenth Series* of these Researches was concluded: in which paper the author pursues the inquiry into the general differences observable in the luminous phenomena of the electric discharge, according as they proceed from bodies in the positive or negative states, with a view to discover the cause of those differences. For the convenience of description he employs the term *inductric*, to designate those bodies from which the induction originates, and *inducteous* to denote those whose electric state is disturbed by this inductive action. From numerous experiments, the author concludes that when two conducting surfaces of small but equal size, are placed in air, and electrified, the one positively and the other negatively, a discharge takes place at a lower tension from the latter than the former; but that, when a discharge does occur, a greater quantity of electricity passes at each discharge from the positive than from the negative surface. The results of similar experiments made in gases are given in a table, shewing that different gases restrain the discharge in very different degrees. The author next directs his attention to the peculiar luminous phenomena attending the disruptive electrical discharge, which he terms *a glow*, and which appears to depend upon a quick, and almost instantaneous charge given to the air in the immediate vicinity, and in contact with the charged conductor. The relations of the glow, the brush, and the spark, are investigated; whence it is inferred that electric light is merely a consequence of the quantity of electricity which, after a discharge has commenced, flows and converges towards the spot where it finds the readiest passage; which conclusions are confirmed by the phenomena which take place in other gases, besides atmospheric air. The last kind of discharge which is here considered is the *convective* or *carrying discharge*, namely, that effected by the translation of charged particles from one place to another; as it occurs in air, in liquids, in flame, and in particles of dust, which are carriers of electricity; and also in that of solids terminated by liquids. Thus, all these apparently isolated phenomena are assimilated, by shewing them to be essentially the result of actions of contiguous particles of matter assuming particular states of polarization. The author lastly considers electric currents, not only in their effects on the bodies they traverse, but also in their collateral influences, as producing inductive and magnetic phenomena.

On May 3, was read to the Royal Society, a *Supplementary Note* to the Eleventh Series; in which Professor Faraday describes his experiments made with the view of determining the specific inductive capacity of dielectrics, by means of an apparatus of the following form:

Three circular brass plates were mounted, side by side, on insulated pillars; the middle one was fixed, but the two outer plates were moveable on slides, so that all three could be brought with their sides almost into contact, or separated to any required distance. Two gold leaves were suspended in a glass jar from insulated wires, connecting each of the leaves respectively with the adjacent outer plate. The amount of disturbance in the electric equilibrium of the outer plates produced by interposing a plate of the dielectric substance to be tried, after charging the middle plate, was taken as a measure of the specific inductive capacity of that dielectric. By varying the size and distances of the plates, and also the distance of the gold leaves from one another, new conditions are supplied for the more exact determination of the relative inductive powers of dielectrics of every description; and by sufficiently reducing the dimensions of the instrument, it may be rendered applicable to comparatively small masses of dielectrics, such as crystals, and even diamonds. An instrument capable of such universal application the author proposes to designate by the name of *Differential Inductometer.*

On June 21, was read the *Fourteenth Series* of these Researches; the author commencing by observing that the theory of electrical induction, which he has set forth in the 11th, 12th, and 13th Series, does not assume or decide anything as to the real nature of the electric forces, but only as to their distribution; the great question respecting the existence of any electric fluid, or of one or two fluids, remaining untouched. He then states what the theory does assume: as, for instance, that all *particles*, whether of insulators or conductors, are, as wholes, conductors; that, being conductors, they can readily be charged, either bodily or polarly; that contiguous particles being on the line of inductive action can communicate their forces more or less readily; that those doing so most readily constitute the bodies called *conductors*, and those doing so least readily those called *insulators*, &c. The author then considers the particular condition of the particles, which, in an insulated body, are held to be polarized; and, having shewn that the theory requires them to be able to polarize in any direction, he anticipates that a greater facility to polarize in one direction than another will still be found to belong to them. He proceeds experimentally to determine this point by observing the degree of inductive force across cubes of perfectly crystalized bodies, as rock crystal and Iceland spar; these being cut so as to have the axis of the crystal parallel to the line joining two opposite faces of the cube; but these experiments require extension. The author then considers whether in compound bodies it is the ultimate and elementary particles or the compound particles which polarize as wholes, and concludes it to be the latter: he next shews how this point bears upon the electrolyzation of such bodies as are separated into simple substances, or otherwise altered by the action of the voltaic current. He then proceeds to certain experiments bearing upon the relation of the electric and magnetic force; and concludes by stating what he thinks more satisfactorily explained by the theory which refers inductive action to an action of contiguous particles than by the old theory.—*Proc. Royal Soc.; Philosophical Magazine.*

BECQUEREL'S ELECTRICAL RESEARCHES.

THE Council of the Royal Society have awarded the Copley medal 1837 to M. Becquerel, for his various Memoirs on Electricity, publishe in the *Mémoires de l'Académie Royale des Sciences de l'Institute de Franc*

and particularly for those on the production of crystals of metalic sulphurets, and of sulphur by the long continued action of electricity of very low tension.*

M. Becquerel appears early to have been sensible that, for the detection of phenomena which may occur at the instant of incipient molecular attraction, and which become masked by the more general effect of the transfer of the elements when powerful electric currents were employed, it was necessary to substitute for these currents of very low tension. Following out this view, carefully adjusting the strength of the current to the power of the affinities brought into action, by electric decomposition, and by subsequent recomposition of the elements, he obtained crystals of some of the metalic sulphurets, of sulphur, of the iodurets of lead and copper, of the insoluble sulphates of lime and barytes, of the carbonate of lead, and other substances; a few of which had previously, by other means, been obtained crystalized, but of which the great majority had only been recomposed in an amorphous state. In the *Mémoires*, M. Becquerel has especially in view to explain, by the agency of electricity of very low tension, continued for an indefinite time, the occurrence of crystalized substances in mineral veins. The success of his experiments in obtaining by such means crystals of the metallic sulphurets and of other substances, perfectly resembling those found abundantly in mineral veins, is favourable to M. Becquerel's views; which accord with the results obtained by others, by means different from those he employed, but involving precisely the same principles. Mr. Fox, in his experiments, which appear to have been conducted on a larger scale than those of M. Becquerel, endeavoured more closely to imitate the arrangements of nature, by introducing, between the substances acted on, walls of clay, in imitation of the "flucan courses" in the Cornish mines; these walls performing the same functions as the moistened clay in M. Becquerel's experiments; and he infers from his results, that the phenomena presented by the mineral veins of Cornwall are explicable on principles similar to those pointed out by M. Becquerel.—(*See pp.* 111 *and* 112.)

Again, the formation of crystals of metallic substances by the agency of electricity was a great step in chemical science. As M. Becquerel very justly observes, the two branches of chemistry, analysis and synthesis, are at present in very different states. With the exception of crystals derived from aqueous solution, which are by far the least abundant of natural crystals,—and a few from fusion, the great mass of crystalized bodies existing in nature had as yet remained inimitable by chemical processes. In the *Mémoires*, not only are experiments described by which crystals of several of these substances have been obtained, but the principles are pointed out, by the application of which we may anticipate that large classes of others will be produced; thus opening the prospect of an abundant harvest of knowledge as regards the recomposition of crystalized bodies, and the processes of nature in the production of such bodies in the mineral kingdom.

ELECTRICITY AND MUSCULAR CONTRACTION.

Dr. J. L. Prevost, having resumed this inquiry, has arrived at results corrective of an hypothesis on the subject, which he published about fourteen years since. The following is one of the Doctor's new results. If

* The *Mémoires* here referred to are translated in the *Scientific Memoirs*, vol. i. p. 414; the resumption of which work by Mr. Richard Taylor, is, indeed, a boon to science.

we observe the muscles of a frog with a magnifying power of four hundred, we perceive that they are composed of small cylinders, the diameter of which varies from five to twenty-hundredths of a millimetre: these cylinders being connected with each other by the cellular tissue, through which pass from one cylinder to the other the nerves and vessels. The fibres arranged thus parallel to one another, fix themselves without separating, either to the tendons or the aponeuroses which correspond to their extremities, the latter becoming round, and disposing themselves in a small cavity placed on the tendon to receive them.

The muscular cylinders, which we shall call fibres, are themselves composed of fibrillæ, the diameter of which amounts to about one-four-hundredth of a millimetre. They are placed in juxta-position in the cylinder, and are united so closely as to appear to a common observer to form a homogeneous mass.

At the surface of the muscular fibres just described, we perceive some rings, which surround them like small ribbands; they are about one-two-hundredth of a millimetre apart from each other upon the fibre when it has lost all its irritability, closer on the living fibre: these rings belong to the enveloping membrane. If this latter becomes fissured longitudinally, we observe the longitudinal fibrillæ which form its mass, project in the fissure. The torn portions of the rings enable us to observe the ends of the reticula of which they are composed, and which cannot be seen in the normal state.

On illuminating the muscular fibres by means of a mirror which reflects the light upon their upper surface, we observe that the nervous reticula which ramify on the muscle enter the linings of the fibres; they thus appear to surround them similarly to a series of circularly curved handles (ansæ). The fibres when quiescent are not straight, but slightly curved. When they act, every portion of the broken line which they present, gravitates the one against the other, and the muscular contraction results from the shortening produced by this action. Such are the facts which every one may observe with a good microscope.

Now, let us apply to this highly remarkable anatomical arrangement, the doctrine of electric currents along the nervous reticula. It is evident that in this case each fibre becomes a little magnet with a flexible joint, the various parts of which would tend reciprocally to attract each other, and would produce the effect which we observe in the muscular contraction. But how are these currents to be detected? Hitherto, they have been sought for only with the electrical multiplier; and we could not expect to find anything, as we had to do with closed circuits, and knew, at the same time, that a divided nerve did not transmit any action. Nothing was left, therefore, but the magnet that would point them out to us: to employ the magnetic needle was rather a difficult affair; and Dr. Prevost had recourse to different means.

If a needle is placed in contact with some finely-divided filings, such as we obtain from a file and soft iron, be it ever so slightly magnetic, it is perceptible from the arrangement which the particles of iron take at its surface: they plant themselves as little needles, and are thus easily perceptible with a magnifier. We must not confound this action with the attraction by which minute bodies remain attached to a bar with which they are touched. Dr. Prevost ran a very fine needle not magnetized into the thigh of a frog, following the direction of the fibres; the point projected, and dipped into the filings. At the moment when he excited a violent contraction by wounding the spinal marrow, he saw the small

particles of iron arrange themselves at the point of the needle as they do when it is magnetic; they disappeared with the irritation of the muscle. —*Bibliothèque Universelle; Philosophical Magazine.*

ELECTRICAL PHENOMENA OF THE TORPEDO.—CONTRACTION OF THE FROG.

M. BECQUEREL has read to the French Academy an account of the researches of M. Matteucci on the electrical phenomena of the Torpedo, and on the contractions produced in the Frog by the contact of the muscles with the nerves; in which paper are some new facts.

He first shews that when the torpedo lances its discharge, no change of volume is observed in its body. When the animal is possessed of great liveliness, the sensation is felt at whatever point of the body it may be touched; but when its vitality is considerably diminished, the discharge is no longer felt, except by touching the electrical organs at two different points.

Matteucci establishes the general laws of the distribution of the electricity as follows:—1. All the points of the dorsal part of the organ are positive relatively to the points of the ventral part; a fact already known. 2. The points of the organ on the dorsal surface, placed above the nerves which enter it, are positive in respect to the other points of the same dorsal surface. 3. The points of the organ situated on the ventral surface, corresponding to the points which are positive on the dorsal surface, are negative in respect to the other points of the ventral surface. 4. The intensity of the current varies with the extent of the platina wires which terminate the galvanometer, and with which the two surfaces of the organ are touched.

When the torpedo is very excitable, the current may be compared to that of a pile consisting of a great number of pairs charged with a good conducting active liquid; whilst, on the other hand, when its liveliness is weak, the electric current resembles that of a pile composed of a small number of elements.

It appears that Matteucci was the first who had the idea of employing for obtaining the spark from the torpedo Faraday's apparatus of the extra current. Matteucci has succeeded in obtaining the spark by placing the torpedo upon an isolated plate of metal, and placing another plate of metal above it, then fixing to each of them a gold leaf separated by the distance of half a millimetre. By slightly moving the upper metallic plate, the animal became irritated, and at the same moment the two leaves approached one another, and the report of the spark was instantly heard.

Matteucci has carefully studied the internal and external causes which influence the discharge of the torpedo; among the external causes we may distinguish, besides the mechanical excitement, heat, in water, at 18° Reau. The torpedo seldom lives more than five or six hours, preserving all its electrical power; on diminishing the temperature this power instantly ceases. On heating the water, the discharges begin afresh, but, if the temperature is increased to + 30° Reau., the animal, after several discharges, suffers violent contractions, and dies in a sort of tetanic state.

Matteucci having analysed the air contained in sea-water, has determined the variations which result from this with respect to the respiration of the torpedo. According to his observations, when the torpedo is tormented, it respires more than when it is not; and what is most

singular is that the former produces less carbonic acid than the other; it would seem, in general, that the intensity of the electric function is in proportion to the force of the circulation and of the respiration.

The action of the most energetic poisons produced the following effects: —Hydro-chlorate of strychnia introduced into the mouth and stomach of a torpedo produced almost immediately violent contractions in the vertebral column, accompanied with powerful discharges, afterwards of weaker discharges; and the animal expired in violent convulsions. Hydro-chlorate of morphine produced in eight or ten minutes after its introduction into the animal very powerful discharges; sometimes more than sixty in ten minutes.

The current of an electrical apparatus composed of eight pairs directed from the mouth to the branchiæ, and to the epidermis of the interior of the organ, produces strong discharges. Electricity acts in this case, probably, only as a violent excitative.

Matteucci next made experiments similar to those by several philosophers, and especially Galvani, and, like them concludes that the brain and the nervous trunks exercise an influence which determines the electrical faculty of the torpedo; but he has better ascertained the extent of this influence. If we tie the nerves, the same effects are produced as on cutting them. When the nerves have been severed, if one of the nervous trunks which branches in the organ is drawn forth with pincers, we still obtain some discharges. If the brain is laid open, and certain parts be irritated with any body whatsoever, the discharge is instantly evident. The first lobes (the cerebral) may be irritated, severed, and even destroyed without the discharge disappearing; the same is the case with the third lobe. The fourth may be touched without producing powerful discharges; on destroying it, even when the others are left whole, the electrical power of the animal is entirely destroyed. This observation will certainly be of great interest to physiologists.

When the animal is in such a state of torpidity as not to give any more discharges, and the ordinary excitatives are employed, if we then lay open the brain, and touch the electrical lobe, the discharges appear with force going indifferently from the back to the belly, and from the belly to the back, whilst no effect is produced on irritating the other parts of the brain; if we employ electricity as the excitative, we obtain a similar result.

M. Matteucci, having entirely separated from a great torpedo one of the electrical organs, without detaching the epidermis, one of the plates of the galvanometer was inserted in the organ near the outward edge, the other plate being put into communication with one of the four nerves; the needle deviated four degrees in the common direction of the discharge of the torpedo; on tying the nerves, there was no longer any deviation; which result appears very remarkable.

The above observations, (which M. Becquerel has not been able to confirm from the want of torpedos,) go to prove, 1st., that the electricity which produces the discharge proceeds from the last lobe of the brain, and is transmitted by the nerves to the organ; 2nd., that the discharge ceasing under the influence of the electric current, when the nerves are tied, must, in order to be transmitted, find in the nerve a particular molecular disposition; a conclusion to which the electro-physiological phenomena of the frog equally lead, as M. Becquerel has indicated in various places in his treatise on electricity.

M. Becquerel's paper concludes with some observations on the contractions of the frog, which go to prove, as has been admitted by several philosophers, that there exists an electric current continually circulating in the nerves and in the muscles of the living frog, by means of a complete are, which can only be rendered perceptible by our apparatus when the animal is in a state of excessive excitation; whilst, by preparing the frog, after the manner of Galvani, the integrity of the arc is destroyed, and we easily recognise the inherent current.—*See Philosophical Magazine*, No. 73, pp. 196—201.*

M. Matteucci, in a letter addressed by him to M. Dulong, announces that his new experiments upon the torpedo completely confirm the results he had previously obtained respecting the unequal power of different parts of the brain in the production of shocks: thus, the hemispheres of the cerebrum may be touched, wounded, and even removed, without a discharge taking place. Again, it may be obtained, but only whilst the animal is very lively, from the *thalami nervorum opticorum*, (*couches optiques*,) situated between the hemispheres of the cerebrum and cerebellum. As to the cerebellum, (*quatrième lobe*,) it cannot be touched without producing a discharge; the effect is still produced, sometime even after the death of the animal, and when this part is removed all discharge ceases.—*Jameson's Journal.*

LAMINATION OF CLAY BY ELECTRICITY.

Mr. R. W. Fox has presented to the Royal Cornwall Polytechnic Society, specimens of clay, which, after having been submitted, in a moistened state, to weak voltaic action for some months, were found, when dry, to be distinctly laminated, having precisely the appearance of clay-slate. This laminated structure is common to many rocks, which are proved, by the organic remains which they contain, to be of sedimentary origin: and the direction of the laminæ or cleavage, with respect to the stratification of any given rock, differs exeedingly in different places, these being at various angles with regard to each other. Hence, it follows that this remarkable structure cannot be referred to slow deposition, or to any mechanical causes. Neither does such complete independence of the stratification and cleavage of rocks in reference to each other, seem to accord with the definite character and tendency of the phenomena of crystalization, to say nothing of the chemical objection to mechanical matter assuming a crystaline form, without undergoing fusion or solution. Mr. Fox's discovery that electricity is capable of producing this structure in clay, seems, in his opinion, to meet the difficulties of the question; and he considers the prevailing directions of the electrical forces, depending often on local causes, to have determined that of the cleavage, and the more or less heterogeneous nature of the rock, to have modified the extent of their influence.—*Society's Report.*

In communicating the details of his experiment to *Jameson's Journal*, Mr. Fox observes that it appears to be a matter of practical importance to ascertain how far, in our mining districts, the productiveness of lodes depends on their bearings with respect to those of cleavage; and especially to note the angles at which the laminæ are intersected in their

* M. Matteucci's Chemical Analysis of the Substance of the Electrical Apparatus of the Torpedo will be found in the Chemical Section of the present volume.

horizontal bearing and underlie, by lodes which yield given ores in the greatest abundance.

METALLIC VEINS BY ELECTRICAL ACTION.

MR. FOX, of Cornwall, who has been, for some time, engaged in the important investigation of the origin of metallic veins by electrical action, has, during the past year, by new and careful experiments, obtained carbonate of zinc, in its natural position between two layers of earthy matter. Pounded killas, with a little sea-water, was interposed in an earthenware trough between the two metallic plates, and a vein of carbonate of zinc, containing a considerable quantity of carbonate of iron, was found, after eight months, to be interposed between the horizontal laminæ of the schistose rock, which adhered so strongly to the sides of the trough, that the latter was, of necessity, broken before the schist could be removed. Mr. Fox considers this to be by far the most important result he has yet obtained.

M. Becquerel objects to Mr. Fox's view of the electric origin of metalliferous veins; and considers it almost certain, that veins have not all been produced by one general cause alone, but that many influences have sometimes concurred in their formation. "It follows," adds he, "from the state of our knowledge of the constitution of veins, that it is impossible to admit, that the fissures which have at different periods opened in the rocks have been filled by substances transported thither by the action of terrestrial electric currents, as they exert no chemical action except where solid conducting bodies and liquids, capable of reacting one on the other, exist. Now, the rocks are not conductors of electricity, and the solid metallic ores were not in existence when these fissures were formed. We must, therefore, admit that other causes than electric currents have filled these rents. The filling up once effected, either entirely or in part, and the water entering from the surrounding rocks, electric forces would then intervene to effect decompoition, and give birth to new combinations."—*Jameson's Journal.*

Dr. Golding Bird has described to the British Association the results of an interesting experiment, shewing the possibility of obtaining, by voltaic action, crystaline metals, intermediate between the poles or electrodes. Having divided a retort into two cells by a partition of plaster of Paris, he filled one cell with distilled water, and the other with sulphate of copper. By a copper-wire he connected a piece of zinc, (which he dropped into the cell filled with water,) and copper pyrites, which he dropped into sulphate of copper. After exposure to a moderate heat, he found particles of copper adhering to the plaster of Paris, and quantities of minuter particles running every where through that substance precisely in the form of the veins that are found in natural mines. —*Literary Gazette.*

Professor Whewell observed, that the facts brought forward bore more directly upon the production of metallic veins, than any yet laid before the scientific world; and he stated, that, in his opinion, they were conclusive in favour of the important Faradian law—that the passage of an electric current was capable of effecting decompositions of compound bodies without the presence of poles or attracting bodies.—*Athenæum.*

LIQUIDITY OF ELECTRICITY.

ON June 2, a paper was read before the Electrical Society, "On Homogeneous Attraction of Electricity," by C. Griffin, Esq. Several

phenomena in electricity induced Mr. Griffin to suppose that, in its ordinary state, it is more analogous to liquids than gases; and the extensive series of experiments detailed in this paper he considers sufficient to establish the existence of the power of homogeneous attraction, the foregoing view of its nature and, consequently, the removal of the common idea of electrical atmospheres. Several every-day appearances in electrical experiments offer very strong evidence in favour of the homogeneous attraction and liquidity of electricity. The spark passes in a full round stream, not swelling out as though there were repulsion amongst its own particles, and many inches through a vacuum, without an appearance of repulsion. The streams across the electrifying machine attract the particles of electricity from a considerable distance on each side of their whole path, evidently also increasing in size.

Other phenomena were brought forward in evidence. The experiments were very numerous in vacuo and in pleno; the former depending upon and shewing the coalition of two currents passing separately and simultaneously into a vacuum. If there were neither momentum nor homogeneous attraction, the two currents ought to move in straight lines directly towards the centre of the ball arranged to receive them. If there were repulsion, they ought to form curves with their concave sides towards each other, and enter the ball on opposite sides. The experiments in pleno were made upon enamelled cards, whereon the current might be traced, and every varied means, such as broad notches cut, raised surfaces, or ridges, and to prevent the current from one positive pole being drawn by the metal of the other out of its course; supposing that if the currents coalesced at some distance from the poles, it could only be due to the mutual attractions of the currents. Each instance appeared to support Mr. Griffin's view; and, moreover, the momentum of mutual attraction being too great for coalition, caused the currents to cross—drawn together again, to recross—pursue their course separately, in some instances divided into three streams, but all finally joining in one stream, the momentum of each, as it were, overcome. And to be so combined, the non-conducting substance, the air, in the case of the notches, was passed through, and in other cases the card was perforated. The experiments were nearly seventy in number.—*Literary Gazette.*

ELECTRICAL CURRENTS IN FERMENTATION AND VEGETATION.

MR. J. BLAKE, of University College, London, from a series of interesting experiments, concludes that when yeast comes into contact with saccharine matter in circumstances favourable to fermentation, the yeast assumes a negatively electrical state, causing the surrounding fluid to become positive. He has likewise found the process of fermentation to be constantly accelerated by the passage of a galvanic current through the fermenting fluid.

Mr. Blake has also ascertained that the decomposition going on at the surface of leaves gives rise to electrical currents. He has demonstrated this by placing a leaf in water, the stalk remaining out of the fluid. A platinum wire was placed in the stalk of the leaf, another wire being placed in the water on the surface of the leaf. On connecting these wires with the galvanometer, a current passed through it which entered from the wire in connexion with the stem. This would tend to shew that the changes taking place on the surface of the leaf cause it to assume a positive state of electricity, negative electricity being given off to the surrounding medium. The direction of the current is not affected by the

presence or absence of light, but a greater quantity of electricity is set in motion during the day than in the night.—*Philosophical Magazine.*

MR. CROSSE'S NEW ELECTRICAL EXPERIMENTS.

On June 19, was read before the Electrical Society, by Mr. Crosse, "An Account of a Series of Daily Observations, made by him with a Sustaining Battery, to ascertain the Increase or Diminution of the Power of the same, as corresponding with the Increase or Diminution of the Temperature of the Atmosphere, during a part of last winter, and commenced previously to the very severe frost which afterwards took place; also, a few Remarks on the Agency of Heat in Electro-crystalization."

For the daily particulars, as noted and registered from a Faraday's Voltameter, we refer our readers to the *Transactions of the Electrical Society.* The observations are for a period of twenty-eight days, from 23rd December, 1837, to 19th January, 1838. The weekly average result is as follows:

	Gas obtained.	Average Temperature.
1st week,	434°;	a little above 50°
2nd ditto,	388	not quite ... 46
3rd ditto,	310½	not quite ... 37
4th ditto,	306	a little above 32

The most singular fact connected with this inquiry is an increase of the power of the battery under a diminution of temperature. The quantity of gas obtained on the last day, with the thermometer at 32°, and with ice in all the cells, was exactly the same as on the first day, the thermometer being at 50°. The total quantity of gas obtained in the fourth week was only 4.5 degrees less than that of the third week, notwithstanding the natural diminution of power in the battery, the increased loss by evaporation of fluids, and the five degrees diminution of temperature. Mr. Crosse was prevented from prolonging his observations by the freezing of the fluid in all the cells.

It may here be observed, that Mr. Crosse had, previously to these experiments, and has since, tried the effects of heat in combination with voltaic electricity in the formation of crystals, that he had exposed several solutions under different conditions to the electric action. The solutions were kept nearly at the boiling point from one to six weeks, the apparatus being plunged in sand-baths, with fires kept up day and night, without a moment's intermission, and the solutions constantly replaced as they evaporated. In sixteen of these experiments, carried on at the same time, the evaporation exceeded seven gallons in every twenty-four hours. Mr. Crosse did not give a succinct account of the different results of these operations, but stated, generally, the following conclusions. Previously, however, to relating them, we must introduce our readers to the apparatus of Mr. Crosse, and its *modus operandi.* For upwards of two years he had found it convenient, in the formation of crystaline and other matters by the electric agency, to make use of porous earthen pots, of the same nature as garden-pots, but without an aperture in the bottom. One of these being filled with a compound fluid, A and B, and plunged in a glass basin filled with another compound fluid, C and D; A of the one fluid having a greater chemical affinity (as it is called) to C of the other fluid, than it has to B, with which it is united, and also B to D; so that, by the admixture of the two fluids, double decomposition would take place; an electric current being passed by means of primary conductors proceeding from the poles of a voltaic battery in constant

action, from one fluid to the other, through the pores of the pot employed, a slow union of A and C, or B and D, or both, takes place, either at the positive or negative pole, or on the inside or outside, or *within the substance* of the pot itself, or in more than one, or in all of these, according to the *nature* and *temperature* of the fluids employed, the *intensity* or *quantity* of the electric current, the thickness of the pots, and the presence or *absence of light*, which last is in most cases of greater or less importance, and in some absolutely essential. The result of this union is commonly the production of regularly or irregularly formed crystaline matters, more or less firmly adhering to the substance upon which or within which they are formed. Mr. Crosse has used these pots in hundreds of experiments, in an infinite number of applications, and with considerable success. He has likewise used them in the place of bladder in sustaining voltaic batteries, for which they are admirably suited. They have, however, one defect. If, while sulphate of copper is used for the negative cells, a neutral salt be employed for the positive, in the course of time crystalizations are found within the substance of the earthenware which separates the two fluids, and the pots are cracked in all sorts of forms—sometimes longitudinally, sometimes laterally; sometimes in concentric layers, the outer or inner portions scaling off like the bark of a tree, and sometimes in small angular or circular fragments, which start off with a slight explosion; so that, after some months' action, the earthen vessel is spotted over with deep indentations. It is, therefore, safer and better to avoid the use of neutral salts in the positive cells, which Mr. Crosse commonly fills with simple water when he wishes to keep up a uniform action for a considerable time, and when he employs these pots merely in the place of bladder.

The experiments and general conclusions follow. A piece of yellow sulphuret of copper was exposed to the electric action in sulphate of copper at the negative pole in the cold, and found, after a given time, to gain a certain weight, the same being Mr. Fox's experiment. A similar piece of the same was exposed exactly under the same circumstances to the same electric power (the solutions kept nearly at the boiling point, be it remembered), and found to gain *thirty-one times* the weight of the preceding in the cold, within the same; such additional weight in both cases mostly consisted of metallic crystalized copper, and red oxide of copper, on the surface of each. Although the solutions were kept at the boiling temperature, the crystals were generally of the most regular form, with their angles and facets quite as perfect as those of a natural formation. In the production of crystalized copper and the red oxide, with a single pair of plates, of about two inches square, plunged in boiling solutions, the increase of crystalized matter averaged *sixty grains in each day*, or one ounce troy in every eight days; consequently, pounds, and even tons may be formed in a comparatively short space of time by an increase of electric action, and the quantity of the solutions employed. In breaking the thick earthen pans in which some of these formations have taken place, crystals of various sorts are found within their substance; also, veins of metallic copper crossing them in various directions, very similar to what are termed the leaders to the metallic lode. Under some circumstances, perfectly insulated crystals of various sorts, not in connexion with either pole or with any metallic substance, are formed in abundance. Mr. Crosse asks: "May it not be possible to apply the combined action of a boiling heat, and continued electricity, to the extraction of metals from their ores in a purer state, and with less trouble and expense than the

plan now adopted?" Mr. Crosse then exhibited a few specimens, and said that he possessed fifty times more at home, and of different kinds, those on the table being chiefly copper and its compounds. Taking up one, Mr. Crosse said: "this is iridescent copper-ore produced in eight months, the simplest thing in the world." The negative and positive state being obtained by sulphate of copper and muriate of ammonia, crystals of various sorts are formed. In all experiments hitherto, at a certain point, the process of crystalization appears to stop; but if carried on in the dark, and with hot solutions and water, there will be no cessation. "Here is the produce of one in the dark, the only specimen of red oxide of copper in cubes, perfectly octohedral, I have ever seen; I believe they are rare in nature." With sulphate of copper and nitrate of strontium, by copper plunged in the boiling solutions (if we heard correctly), nitrate of strontium was formed in one year and one week. Six-sided prisms of carbonate of lime, attached to a coil suspended in a glass vessel, formed in the dark, were destroyed when exposed to the light.

We cannot, however, further proceed with Mr. Crosse, as demonstrator, through the productions of rhomboidal crystals of selenite, sulphurets of zinc, acetates of copper, incrustations of copper, concentric layers of the same analogous to shells, &c. From the peculiarities attending the splitting of the panes, he is inclined to think that fissures in the earth are first made by electricity passing through moist clay; and, from the results of his experiments, he believes that every substance found in the earth, gems or what not, can be formed by the union of pressure, heat, electricity, and absence of light. Mr. Crosse is altogether a wonderful experimeter; and, withal, humble and unassuming, liberal, and ready to communicate—the constant characteristics of a true philosopher.—*Literary Gazette.*

THEORY OF VIBRATION.

On May 19, was read to the Electrical Society the recapitulation of Mr. Pollock's paper, "On the Connection between the Atomic Arrangement and Conducting Power of Bodies;" also, further evidence in favour of the Theory of Vibration. Mr. Pollock considers that the following observations respecting the lightning stroke may tend to remove some of the doubts, which may still be entertained, of the existence of vibration. In estimating the nature of any motion through any medium, the force generating the motion, and that of the resistance of the medium, must be taken into consideration. The lightning stroke being forked proves that the force of the electric fluid, and that of the resistance of the air, are not the same during the transmission of the lightning stroke through air; consequently, its velocity and motion are not continuous and uniform, but by alternate stages of greater and less velocity, and, therefore, by vibration. Thus, the force of the electric fluid is in excess when it overcomes the resistance of the air pursuing its onward course; and the force of the air in excess when the forking or reflection takes place. This phenomenon proving that the electric fluid does not pass through a medium with uniform velocity, shews also that the force of the fluid varies with the quantity; for, if the quantity be small, the forking or branching occurs more frequently, as when the fluid passes between two knobs of two conductors. This is analogous with the progress of light through a medium, and proves that an electric current passes through matter undergoing vibration, having its expanding stage when the force of motion, and its contracting stage when the force of re-

sistance predominates. A continuous current of the electric fluid is, therefore, a chimera, not existing in nature. In a note, Mr. Pollock states, that, since the foregoing paper was written, he had met with some observations of Mr. Faraday, in section 897 of his "Researches," most favourable to his view of vibration. The passage quoted states the difficulty, and almost impossibility, to decompose bodies by a current from a single pair of plates, even when so powerful as to heat bars of metal red hot; explained why, and considered the action of the battery as of the nature of antagonist forces—one effecting decomposition, and the other combination, by heating metals and uniting them to oxygen. This view of Mr. Faraday's was considered by Mr. Pollock as almost identical with that by which, in a former paper, he attached a definite meaning to the terms quantity and intensity; these being the natural result of the vibration of matter.—*Literary Gazette.*

ELECTRICAL COMPOUNDS.

On July 3, Mr. Maugham submitted to the Electrical Society a new mode of forming an extensive class of compounds. When the charcoal points are approximated, under water, so as to obtain the brilliant light, a compound, consisting of hydrogen and carbon, is precipitated, and a gas, the carbonic oxide escapes, or may be collected on the surface. Mr. Maugham observed, that the action may be extended by multiplying the pairs of points, and varied by changing the substances of which they may be composed, as well as by immersing them in different solutions, instead of water. These facts excited great attention and interest.

ELECTRICITY OF WOOD.

M. Ratt, a cabinet-maker, when planing wood, remarked that several chips manifested electric phenomena. By means of an electrometer he ascertained, that in certain species, especially those of America, the electricity was positive, while in others it was negative, and this particularly characterised the French woods.—*Athenæum.*

PASSAGE OF ELECTRICITY THROUGH A VACUUM.

It has been usually considered that the electricity is retained about conductors by the atmosphere, and that it would be rapidly dissipated in a vacuum. By some experiments recently made by M. Masson in the barometric void, it would appear that this is not the case; and he thinks the currents obtained by Davy are due to the concourse of some conducting fluid.—*Railway Magazine.*

SOUNDS CAUSED BY ELECTRICITY.

M. Sellier has found it sufficient to place an electric diamond upon a pane of glass in order to produce sounds. When a well polished sewing needle, suspended from a hair, is placed in a glass bowl filled with an acid sulphate of copper, the bowl crackles, even after the needle has been withdrawn and the liquid poured out. Small currents of common electricity become preceptible to the ear, by means of wheaten straw, struck upon a drum of vegetable paper.—*Athenæum.*

ELECTRICITY IN TIC DOLOUREUX.

M. Magendie has obtained the happiest results from the application of electricity in affection of the senses, particularly in that acute disease termed the tic doloureux. He causes the electric current to pass over the nerves by means of needles of platina, placed at greater or less intervals.

In some instances, a single application is said to have been sufficient; and, in one case of dreadful suffering, in which the patient had long been forced, from the pain of speaking, to express his desires by writing, six applications to the nerve entirely removed a malady of three years' duration.

MAGNO-ELECTRIC CURRENTS.

M. MATTEUCCI has repeated his celebrated experiments before M. de la Rive, shewing the important fact that in making across a canal of mercury a communication between the ends of two similar metal wires, the one hot and the other cold, fixed at the two extremities of a galvanometer, a current in the wire of the galvanometer is always produced, whatever be the temperatures, and in one direction from the hot to the cold wire. Bismuth also shews a contrary current. The anomalies of copper and iron cease at a very high temperature. He has shewn that it is not the mercury which causes the currents; and that in the act of solidification of bismuth, and certain amalgams of bismuth and antimony, the currents are independent of the nature of the two wires, or even of the relation between their position and the direction of the current. Similar experiments with tin, zinc, and lead, produced no currents, even in the amalgams of bismuth and mercury. If the quantity of mercury is too great, unless the amalgam be liquid at ordinary temperatures, currents are not produced in the same circumstances in which they existed with metals not amalgamated, or with amalgams containing less mercury. This property of bismuth and antimony appears to be peculiar to those metals, and to be deserving of study.—*Railway Mag.*

DECOMPOSITION OF WATER BY THERMO-ELECTRICITY.

MR. F. WATKINS, Charing Cross, employs a massive thermo-battery, with pairs of bismuth and antimony, a small apparatus for the decomposition of water of the ordinary description, and an electro-dynamic helical apparatus. The primary coil of wire is ninety feet long, and when the thermo-battery current simply pervades this coil, Mr. Watkins does not notice any disengagement of the gases; but so soon as the contrivance for making and breaking battery contact is put in action, then an evolution of the gases takes place, while powerful shocks are received from the secondary coil of wire 1,500 feet long.—*Philosophical Magazine.*

CONCENTRIC GALVANIC PILES.

M. JULES GUYOT has constructed galvanic piles of a particular form, which he calls concentric. In these piles, one pole is at the centre, and the other at the circumference. New properties and remarkable analogies are said to result from this combination; as we find at the surface of spherical piles made to revolve, all the influences of gravity and terrestrial magnetism at the surface of our globe. A pile, four inches in diameter, composed of concentric layers two inches high and six in number, being charged with pure water, gives strong shocks even after the lapse of twenty-four hours.—*Mining Journal.*

CHEMICAL THEORY OF GALVANISM.

PROFESSOR SCHŒNBEIN concludes an able contribution to the *Philosophical Magazine*, in advocacy of the chemical theory of galvanism, with the following remarks:—"In the experiments described, chemical actions and voltaic effects appear, indeed, so closely connected with one another, that an unbiassed mind can hardly help considering the first as

the cause of the latter." * * * "Up to the present moment I have considered the definite action of an electric current, and the fact, that the quantity of the latter produced by an hydro-electric arrangement is determined by the quantity of metal oxidized, as the most conclusive proof of the dependence of current electricity upon chemical action; but, to my great surprise, I am now given to understand that these important facts do not prove anything at all in favour of the chemical theory; though I have not yet been so fortunate as to meet with even the slightest attempt to explain them according to the principles of Volta's hypothesis. Certainly, if Faraday's beautiful discovery is rejected as an evidence, we must despair of finding out another of more weight."

FIRING BLASTS UNDER WATER BY GALVANISM.

MR. BETHELL's attention was directed to this subject in 1834, when engaged on experiments with his new diving dresses. It is frequently necessary to blow off the upper decks of a wreck so as to get at a cargo with facility. Great difficulty arose in igniting the powder; and a fuze of cotton, steeped in spirits of wine and gunpowder, and inclosed in a caoutchouc tube, being both uncertain and expensive, the idea occurred of trying the galvanic battery. It is well known, that when the ends of two copper wires leading from the poles of the galvanic battery are connected by a piece of platinum or iron wire, the latter becomes red hot. To apply this method, the top of the tin canister which contains the charge is fitted with two copper wires, about six inches long, passing through a piece of cork, and connected at their lower ends by a piece of platinum or iron wire. The canister being charged, the platinum or iron wire is pushed down into the middle of the charge, and the top of the canister cemented on with putty. The wires are well coated with a non-conducting medium, as a mixture of resin, wax, and tallow, or caoutchouc, excepting at their lower end, where they are connected by the platinum, and at the upper, where they are to be connected with the two long copper wires which proceed to the battery. These connecting wires, covered with cotton thread, are coated with caoutchouc varnish, and then tied together so as to form one rope. The diver having connected the wires of this rope with the wires of the canister, and uncoiled a sufficient length of rope, descends, and deposits the canister in the wreck or hole prepared for the blast, and returns to the surface. The other ends of the wire are then dipped in the mercury cups of the galvanic battery, and, the platinum wire becoming instantly red hot, the charge is exploded. There is not more than about six inches of the wire rope lost at each discharge. In quarries, any number of charges could be fired at the same instant, or in rapid succession; and this method possesses advantages over every other for the military engineer, since any number of mines could be exploded at the same instant.—*Athenæum.*

LARGE AND VERY SENSIBLE THERMOSCOPE GALVANOMETER.

THE chief novelty of this instrument, which has been constructed by Dr. Locke, Professor of Chemistry in the Medical College of Ohio, consists in its proportions and the resultant effects. The object proposed in its invention, was to construct a thermoscope so large that its indications might be conspicuously seen, on the lecture table, by a numerous assembly, and at the same time so delicate as to shew extremely small changes of temperature. How far the Professor has succeeded, will, in some

measure, appear by a very popular, though not the most interesting experiment which may be performed with it. By means of the warmth of the finger applied to a single pair of bismuth and copper disks, there is transmitted a sufficient quantity of electricity to keep an eleven-inch needle, weighing an ounce and a half, in a continued revolution, the connexions and reversals being properly made at every half turn.

The greater part of this effect is due to the *massiveness* of the coil, which is made of a copper fillet about fifty feet long, one-fourth of an inch wide, and one-eighth of an inch thick, weighing between four and five pounds. This coil is not made in a pile at the diameter of the circle in which the needle is to revolve, but is spread out, the several turns lying side by side, and covering almost the whole of that circle above and below. The best idea may be formed of the coil by the manner in which it is actually modelled by the workman. It is wound closely and in parallel turns on a circular piece of board eleven and a half inches in diameter, and half an inch in thickness, covering the whole of it except two small opposite segments, of about ninety degrees each. The board being extracted, leaves a cavity of its own shape to be occupied by the needle.

The copper fillet is not covered by silk, or otherwise coated for insulation, but the several turns of it are separated at their ends, by veneers of wood, just so far as to prevent contact throughout. In the spreading out and compression of the coil it is similar to Melloni's elegant apparatus, though in Professor Locke's isolated situation in the interior of America, he was not acquainted with the structure adopted in the prior invention. In the *massiveness* of the coil, the instrument is, perhaps, peculiar; and by this means it affords a free passage to currents of the most feeble intensity, enabling them to deflect a very heavy needle. The coil is supported on a wooden ring furnished with brass feet and levelling screws, and surrounded by a brass hoop with a flat glass top or cover, in the centre of which is inserted a brass tube for the suspension of the needle by a cocoon filament. The needle is the double astatic one of Nobili, each part being about eleven inches long, one-fourth wide, and one-fortieth in thickness. The lower part plays within the coil, and the upper one above it, and the thin white dial placed upon it, thus performing the office of a conspicuous index underneath the glass.

This instrument is very sensible to a *single* pair of thermo-electric metals, to the action of which it seems peculiarly adapted; but the efficiency of such metals is increased by a repetition of the pairs, as in the thermo-pile of M. Melloni, especially if they be massive in proportion to the coil itself. With a battery of five pairs of bismuth and antimony, the needle was sensibly moved by the radiation from a person at the distance of twelve feet, without a reflector, the air being at the temperature of seventy-two degrees.

M. Melloni has expressed his opinion that with a thermo-pile, massive in proportion to the coil, this galvanometer might be made to exhibit his thermo-experiments advantageously to a large class. Some idea may be formed of its fitness for this purpose from the result of a single trial on transmission. The heat from a small lamp with a reflector, at the distance of five feet, passed through a plate of alum, and falling on a battery or pile of five pairs of bismuth and antimony, deflected the needle only a fraction of one degree; but on substituting a similar plate of common salt, the same heat produced, by impulse, an immediate deflection of thirty-three degrees.

Although the instrument is finely adapted by its size for the purpose for which it was intended, class illustration, yet, from the weight of the needle, and the difficulty of bringing it to the rest after it once acquires motion, it is not so suitable for experiments of research as the Mellonian galvanometer. When a massive thermo-pile, such as has lately been made by Watkins and Hill of Charing Cross, is connected with the coil and excited by a heat of about 200°, the needle being withdrawn a distinct report is obtained on interrupting the circuit; in producing this effect it is less efficient however than the ribbon coil of Professor Henry. The tube for suspension, placed over the centre of the instrument, is so constructed, as to admit of being turned round by means of an index, which extends from it horizontally over the glass cover, and thus any degree of torsion may be given to the suspending filament or wire. A wire of any desired thickness may be easily substituted for the cocoon filament, when the instrument becomes adapted to measuring the deflecting forces of the galvanic battery. By using a thick wire, it was ascertained that the calorimetor of Professor Hare, having forty plates, each eighteen inches square, acted on the needle with a force equal to ninety-two grains, applied at the distance of six inches from the centre. In attempting to force the needle by torsion into a line parallel to the coil, where the deflecting current acts with the greatest strength, Professor Locke accidentally carried it too far and reversed its *position*, when instantly it became reversed in *polarity*, that which had been the north pole becoming the south. This shewed how unfit is the magnetic needle to measure such a quantity of electricity as was then flowing through the massive conductor. The instrument is well adapted to shew to a class the experiments upon radiant heat with Pictet's conjugate reflectors, in which the differential, or air, thermometer affords, to spectators at a distance, but an unsatisfactory indication. For this purpose, the electrical element necessary is merely a disk of bismuth as large as a shilling, soldered to a corresponding one of copper, blackened, and erected in the focus of the reflector, while conductors pass from each disk to the poles of the galvanometer. With this arrangement, the heat of a non-luminous ball at the distance of twelve feet will impel the needle nearly 180°, and, if the connexions and reversals are properly made, will keep it in revolution.—*Philos. Mag.*

VOLTAIC CONDITION OF IRON.

Professor Schœnbein states that according to his experiments, peroxide of silver proves to be the most powerful means for exciting in iron its peculiar voltaic condition. It surpasses in this respect, even the peroxide of lead. An iron wire, for instance, one end of which is covered with only a small particle of the first-mentioned substance, will not be attacked either by nitric acid of any degree of dilution, or a solution of blue vitriol. The voltaic association of one substance with the other is easily effected by connecting one end of an iron wire with the positive electrode of a pile, and by plunging for a few minutes the other end of the wire into a solution of nitrate of silver.—*Philosophical Magazine.*

VOLTAIC BATTERIES.

On April 23, a paper was read to the Royal Irish Academy, by Edward S. Clarke, Esq., "On an Improvement which he had lately made in the Sustaining Battery, and on the Size proper to be given to the Zinc Element of Sustaining Batteries in general." The author alluded to the decline of voltaic power which occurs during experiment, and

ascribed to M. Becquerel the credit of having assigned its true cause; referring it, as this philosopher did, to a transfer of the decomposed substances to the respective plates, in such a way as to produce secondary currents moving in a direction reverse to the primary current. Mr. Clarke also alluded to the fact, that Becquerel was the first person who, to remedy this evil, adopted, in 1829, the use of a membraneous partition, and two different liquids, to separate the respective metals; but added, that the form this philosopher adopted was imperfect, in consequence of the difficulty of affixing the membraneous portion stanchly to the sides of the square glass box which contained the two different fluids. The author, after referring to the sustaining battery of Professor Daniell, and to the modification of that apparatus adopted by Mr. Mullins, exhibitĕd to the Academy a battery which he had devised to remedy a defect affecting all previous combinations, and in which each surface of the hollow zinc cylinder had, as first recommended by Mr. Wollaston, a surface of copper opposed to it.

An account was also given of several instances, which shewed the advantage of his form in calorific and electro-magnetic experiments. Mr. Clarke's improvement consists in attaching a ring of zinc by zinc rivets to the top part of the outside of the hollow cylinder of zinc used in the arrangement of Mr. Mullins, and drawing a bladder over this cylinder, to which it is secured by a cord to the ring: and in replacing the earthenware jar by a copper cylinder, which is furnished with a mercury cup, as are also the zinc cylinder, and the central copper. The central copper and the outer copper case are connected by a wire dipping into the cups. A solution of sulphate of copper is poured, as well into the outer case of copper, as into the bladder surrounding the central copper, and muriate of ammonia into the bladder enclosing the zinc. The author concluded by detailing some experiments, tending to shew that, (contrary to the opinions of M. Marianini and Mr. Mullins,) the maximum effect is obtained when the surface of the zinc element is equal, or nearly so, to that of the copper.—*Athenæum.*

NEW HEATING EFFECT OF A CONSTANT BATTERY.

MR. J. R. GASSIOT has communicated to Mr. Brayley the following result, obtained with an extensive series of the voltaic battery made on the principle of that of Professor Daniell. The battery consists of 160 half-pint earthenware jars, the zinc elements being placed inside, the size permitting the use of brown paper in lieu of membrane, the exciting liquids being saturated solutions of sulphate of copper and common salt. The effects were of the most brilliant description, and the results as to the heating power were curious.

On placing the ends of the connecting wires about two inches from their extremities, across each other, and about one-eighth of an inch apart, the usual appearance of flame took place: on gradually withdrawing the wires at this connexion, the flame could be increased to one-fourth of an inch in length. In about half a minute, the end of the positive wire became red-hot; it very shortly increased to a white heat, until at last it could not bear its own weight, but turned over, as indicated in the figure. Considering that the effect might possibly be due to some peculiar property in the wires, they were reversed, but the effect was the same, the

Pos. Neg.

positive wires being invariably heated *at least* two inches beyond the contact, while the negative remained cool. The experiment has since been repeated many times in the presence of Professors Faraday and Daniell, Mr. Pereira, F.R.S., and Mr. Brayley. It having been suggested that the effect might be due to the particular metal of which the electrodes were formed, Mr. Gassiot afterwards changed the copper wires usually employed, successively for wires of platinum, iron, steel, and brass, when the same phenomenon was exhibited in each instance, proving it to be due to a cause primarily connected with the activity of the pile.—*Abridged from the Philosophical Magazine.*

POWERFUL ELECTRO-CHEMICAL BATTERY.

A POWERFUL el ctro-chemical battery, has been executed by Mr. E. M. Clarke, at the Gallery of Science, Lowther Arcade. Its effects are truly surprising. Cylinders of coke when placed in the circuit produce a light so intense the eye cannot dwell on without pain. Copper wire of one-quarter of an inch diameter is rapidly fused; but the most extraordinary fact is that, notwithstanding such intense power, the experimenter holds the conducting wires in each hand, and states that the battery gives no shocks without the aid of a coil of wire on the principle of Professor Collons.

NEW VOLTAIC COMBINATION.

ON April 9th, Professor Apjohn read a paper to the Royal Irish Academy, "On the Properties of a new Voltaic Combination," by Thomas Andrews, M.D. The object of the author in this paper is to extend the results which he has already obtained on the influence of voltaic circles upon the solution of the metals in nitric acid to the case of concentrated sulphuric acid. When a plate of zinc is heated to the temperature of 240° cent. in sulphuric acid, of the sp. gr. 1.847, it is dissolved with the rapid disengagement of a mixture of hydrogen and sulphureous acid gas; but when a similar plate, voltaically associated with a platina wire, is introduced into the same acid, its rate of solution is reduced to one-third of the other, no gas appears at the zinc, and sulphureous acid, almost perfectly pure, separates at the platina wire. Similar effects occur at other temperatures; but the proportion between the quantity of zinc dissolved when alone, and when connected with platina, varies with the temperature. A minute investigation is given of the effect of the distance between the metallic surfaces, and of their relative extent upon the solution of the zinc, and the development of the electrical current; from which it appears that, as in common cases, the action on the zinc was increased by diminishing the distance between the zinc and platina in the liquid, but, on the contrary, was diminished by increasing the extent of the platina surface. The latter anomalous result is carefully examined and explained. The influence of the contact of platina with the other metals, resembles, in general, its effect upon zinc, except in the cases of mercury and arsenic, in which the solution does not appear to be retarded in this way, nor is there scarcely any gas evolved from the platina. The general conclusion drawn by the author from all his experiments is, that the formation of a voltaic circle generally diminishes, and never increases chemical action, when the liquid conductor is an oxyacid of such a strength, that the electro-positive metal is oxidized from the decomposition, not of the water, but of the acid itself.

IMPROVEMENT IN MAGNETICAL APPARATUS.

THE Rev. William Scoresby has pursued an extensive series of observations on this subject, both as to the law of combination in steel-plates and bars, and as to the effect of temper, thickness, &c. on the aggregate power; with the view of producing more powerful instruments for determining the delicate variations in, and the actual condition of, the earth's magnetism; a subject now engaging attention in some of the principal observatories in Europe. The results which have been successful beyond the objects originally contemplated, have been lately communicated to the Institute of France. One of these results is that of producing permanent artificial magnets of almost unlimited power. On the principle of the construction of compound magnets hitherto adopted, only a very limited number of bars could be combined with advantage, in consequence of the great deterioration of power occasioned by the condition of violence. Mr. Scoresby found, on combining very superior plates of tempered steel of two feet in length and about one-twenty-fourth of an inch in thickness, that the first six plates received so much power that no additions, however great the number, were capable of introducing more, in the aggregate, than about double that power. Aiming, however, to counteract the tendency to such rapid deterioration, Mr. Scoresby made some magnetical combinations of *perfectly hard* steel plates (which he has a method of magnetising and testing), by means of which an almost unlimited power can be obtained. Already this combination has been carried, with no inconsiderable augmentation of the aggregate energy, to the very last, to the extent of several dozens of hard plates, fifteen inches in length, so as to produce, by such combination, a compound magnet of very extraordinary power for its mass. The adaptation of this principle to apparatus for magnetic electricity will obviously be of much advantage for compactness and power; whilst the application of the discovery to variation-needles, dipping-needles, and, probably, to sea-compasses also, promises to be of much importance in experimental science, as well as for practical and economical purposes. Mr. Scoresby's investigations have likewise led to other practical results; such as the means of testing most rigidly the quality and temper of steel plates, and of bars intended for compound magnets on the ordinary construction, by which the best plates can be selected. and the most powerful combinations may be obtained.—*Philosophical Magazine; abridged.*

On Nov. 30, Professor Gauss, of Göttingen, received from the Royal Society, a Copley medal, for his recent improvements in the methods of making Magnetic Observations, and for his theoretical investigations relative to Terrestrial Magnetism. By the use of heavy needles, if the word may be applied to magnetical bars from one to twenty-five pounds in weight, by a multitude of ingenious and delicate applications of principles more or less well known in the abstract, but never before brought into combination, and, above all, by a profound and powerful mathematical analysis, embracing the subject of terrestrial magnetism in a general point of view, and furnishing resources before unimagined for estimating its effects in the various phases of inclination (or dip), declination (or variation), and intensity,—Professor Gauss has given to magnetic determinations the precision of astronomical observation, and, in fact, may almost be said to have created anew this important department of science.

One very extraordinary fact has already resulted from this system of observation, carried on (in pursuance of a suggestion of Humboldt,) by a great many observers in correspondence with each other, viz., that the magnetism of the earth is a state of continual and restless fluctuation—as much so as the waves of the sea, or the pressure of the air; but that its changes from *moment to moment* are strictly simultaneous, at every point where observations of this nature have yet been made—embracing (now) the whole extent of Europe, from Upsal in Sweden, to Catania in Sicily, and from St. Petersburgh to Dublin! so that even the difference in longitude of these distant stations might be obtained from magnetic observations. Does this law extend all over the world? Are the causes of these fluctuations terrestrial or cosmical? Can all the complicated phenomena of terrestrial magnetism be embraced in formulæ as unerring and general as those of the planetary movements? What are the true causes of the variation, dip, and intensity curves over the surface of the globe? These and other such questions await their solution from a more extensive application of these methods in all parts of the world.—*Athenæum.*

Sir John Herschel, in eulogizing Major Sabine's report on the magnetic survey of Great Britain, at the late meeting of the British Association, observed, that he would not pretend to anticipate the importance of the results, but he saw an epoch fast approaching when Terrestrial Magnetism would take its place among the strictest of the mathematical sciences; he could not but believe, that the day was near when, perhaps, it would rank second only to astronomy, and when its details would be as well understood as the doctrine of the pendulum, and its dynamics studied as those of any other branch of physics. Some of the late determinations of Gauss, were truly sublime. He has just ascertained that the variation is subject to small oscillations, which take place simultaneously everywhere over the whole of Europe, and probably, over the earth, so that the cause of this appears to be communicated in an instant from the east to the west.

It is a remarkable circumstance, that at the commencement of the present century, there was not a single published observation to attest the existence of any difference whatsoever in the intensity of the magnetic force at different parts of the earth.—*Major Sabine.**

NEEDLES RENDERED MAGNETIC BY THE NERVES.

Dr. Prevost, of Geneva, has succeeded in magnetizing very delicate soft iron needles, by placing them near to the nerves, and perpendicular to the direction which he supposed the electric current took. The magnetizing took place at the moment when on irritating the spinal marrow a muscular contraction was effected in the animal. This important note was communicated by M. Becquerel to the French Academy from a letter by M. de la Rive.—*Compte Rendu, Jan. 2: Philosophical Magazine.*

MAGNETIC ACTION OF THE COMPASS IN IRON STEAM SHIPS.

Professor Airy, Astronomer Royal, has, at the request of the Admiralty, been engaged in a series of observations and experiments for correcting the local magnetic action on the compass, in the iron steam-ship the *Rainbow;* the results of which he has communicated to the

* A masterly analysis of Major Sabine's Report, illustrated with diagrams will be found in the Athenæum, No. 581.

British Association, in a letter to Professor Whewell, whence the following is an extract:—

"The compass was placed in four different stations near the deck, and in four stations about thirteen feet above the deck; and for each of these the ship was turned round, and the disturbance observed in many positions. The disturbances even at the upper stations were great, but at all the lower stations they were very great, and at the station next the stern they were enormous. The whole amount there was 100° (from — 50° to + 50°); and on one occasion, in turning the vessel about 24°, the needle moved 74° in the opposite direction. I should have perhaps found some difficulty in reducing these to laws if I had not made some observations of the horizontal intensity at the four lower stations, in different positions of the ship. From these I was able to infer the separate amounts of disturbance due to the permanent magnetism of the ship, and to the induced magnetism, and to construct correctors. These correctors I tried completely at the sternmost station, and imperfectly at two others. The correction at the sternmost station was (speaking generally) complete; the extreme of deviation, which formerly exceeded 100°, did not, with the corrector, exceed one degree. At the other stations I had not leisure to adjust the apparatus: but I fully expect to-morrow to produce the same accordance at them. This result is, I should think, important in a practical sense. Some theoretical results, which I did not anticipate, are also obtained. At the stern position, the disturbance is produced almost entirely by the permanent magnetism, the inductive magnetism producing only one-twenty-fifth of the whole effect. Going towards the head, the effect of the permanent magnetism diminishes, and that of the inductive magnetism increases, till the latter produces about one-third of the whole effect. The resolved part of the permanent magnetism transverse to the ship, varies little (increasing somewhat towards the head): the part longitudinal to the ship decreases rapidly from the stern to the head (where it is less than the transverse part)."

Mr. Baily, (who assisted the Professor in one day's observation,) described to the Association, the method of observing the deviation of the needle, caused by the immense mass of iron in this vessel, the *Rainbow*, by theodolites fixed in proper positions on the shore; the deviation of the needle, as the ship's head was veered round, was ascertained, when the needle on board was placed in different parts of the vessel.—Sir John Herschel said, that Barlow's compensating plate having been found inapplicable to the correction of the effect of such large masses of iron, it became a problem of much interest to find out an adequate correction, when the following principle was suggested by the Astronomer Royal: After the effect of the vessel upon the compass, while on board, had been determined, as described by Mr. Baily, the compass was removed to the shore, and placed in the neighbourhood of a large mass of iron, in such a way that the effect of this mass was the same as that of the vessel, a compensation for this was then applied to the compass: and, upon removing the entire apparatus on board, it is obvious the ship, which is an exact equivalent for the mass of iron (now left on shore,) must be exactly compensated also.*

* A ludicrous circumstance had occurred, proving the necessity of this compensation. When they were bringing the vessel round from Glasgow, where she had been built, they had hazy weather, and at the Land's End they were under the necessity of hailing a vessel to know where they were. The crew of the other vessel were in amazement to conceive why a ship of such magnitude had been entrusted to such a set of land-lubbers.

Capt. Johnson, R. N. said, that Barlow's compensating plate was fully adequate to the compensation of such a mass of iron as that in the *Rainbow*, as he had frequent opportunity of proving; in fact, the maximum deviation of the needle would not be more than 13° when the compass was suspended eighteen feet (we believe) from the deck.—*Athenæum.*

On July 3, a paper was read to the Electrical Society, by Mr. Nayler, of Southsea, "On the Local Attraction of Iron-built Steam-vessels;" a property whereby the indications of the compass are made to depart from the truth, except when the ship's-head is nearly north or south. The paper was accompanied by a table shewing the deviation at Northfleet and at Baffin's Bay, as observed by Captain Parry, in the *Hecla*, in his first Polar Voyage; also the computed local attraction, on the supposition that it receives its change in quantity from that principle which augments the natural variation of the compass. The deviations, more or less than the true bearing, are not constant quantities. The intensity of derangement is increased, but its character is not changed. For instance; when the ship's-head was N. by E. at Northfleet, the compass shewed one degree *less* than the true bearing of an object on shore; and when at Baffin's Bay, on the same point, a deviation of 3° 17′ 15″ was shewn. It was also *less* than the true bearing.

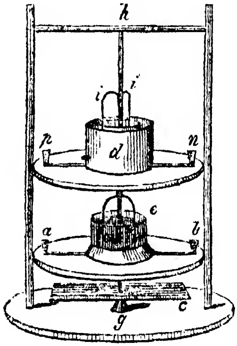
All vessels are subject to local attraction; but, built in the ordinary manner, it has hitherto not shewn itself in a quantity for which the course steered need be corrected. In iron steamers, however, the intensity will be greatly increased, and Mr. Nayler earnestly advises the local attraction of an iron steamer to be taken previously to her departure, and at the different ports she may reach; and a table of the variation to be kept. Being once accurately ascertained in its quantity, all danger from its existence ceases, since every course steered can be corrected for it.

On a previous occasion (June 2), a paper was read upon this interesting inquiry by C. V. Walker, Esq., observing that "although the compensating plate of Barlow may be available when the ark of deviation is small (as on board wooden-built ships), yet in iron steamers, on account of the much larger arc, it is impracticable. The deviation is not only considerable—as much as 56°, as observed on board the *Rainbow* Liverpool iron-steamer—but it is the reverse of what occurs in all other cases. In ordinary vessels, the deviation is accounted for by the united action of many magnets, the resultant of the forces affecting the needle; whereas, in the present, it is effected by the single action of the iron vessel, which becomes one large magnet, having in northern latitudes its stern a south pole; the deviation depending upon the position of the compass, in relation to the preponderance of the mass. Two suggestions were given to navigators of steam-vessels. 1st. To select some elevated spot for a standard compass; 2dly. To steer on observed (not on true) courses." The paper, in conclusion, urged the captains of such vessels carefully to register any phenomena they may observe, stating that the fruits of their labours will be kindly welcomed by the Electrical Society.—*Literary Gazette.*

MAGNETIC ELECTREPETER AND ELECTROTOME.

Dr. Page, of Washington, has communicated to Professor Silliman's *Journal* the annexed instrument, designed chiefly to aid the operator in exhibiting the magneto-electric properties of flat spirals; which phenomena are very interesting, from their being strictly magnetic, produced

without the presence or co-operation of ferruginous bodies. The object of the instrument, as its name (electrotome) implies, is to break the circuit, and as it accomplishes this by changing the direction of the galvanic current, it is also a self-acting electrepeter.



A rotating electro-magnet would effect the same object; but the introduction of an electro-magnet or a coiled wire, in any part of the circuit, would detract from the value of the spiral. (*g*) is a thin base board of mahogany, which, when the instrument is in use, is to rest upon the spiral coil or the box containing it. At the centre of the base (*g*) is a pivot sustaining the magnetic bar of steel (*c*) and its axis, the extremity of which plays freely in the centre of the cross piece (*h*.) Between the upright pillars are secured two circular pieces of mahogany (*a b*) (*p n*) to serve as supports for the mercury cells (*d* and *e*). The circular box (*d*) contains two concentric mercury cells, insulated from each other, and connected with the poles of a battery by the separate wires and cups (*p n*). The centre of this box is open to admit the shaft of the magnet, as is also the centre of the box (*e*). This box is made of two glass cylindrical sections, cemented into a groove of a turned cup or base of wood. It contains two cells for mercury nearly semicircular, and insulated from each other, precisely as the cells for the Ritchie magnet. These cells are connected with the extremities of the spiral by the separate wires and cups (*a b*). The two wires (*i i*) are well insulated by a winding of varnished silk, and secured in their positions on the shaft by silk thread. The upper extremities of these wires dip into the concentric cells of (*d*), and the lower into cells of box (*e*). The base board is made thin, and the pivot (*g*) short, to allow the magnet to come as near as possible to the spiral. Place the instrument upon the spiral, make the connexions as above directed, and the magnet immediately commences a rapid rotation by the influence of the spiral. The instrument should always be placed without the centre of the spiral, and in such a manner, that the insulating pieces between the cells of (*e*) should be in the direction of a radius of the spiral.

POLARIZATION OF PLATINA ELECTRODES.

M. Matteucci has communicated the following results of his experiments to the French Academy of Sciences.

1. Plates of platina, used as electrodes in water, become covered with traces of oxygen and hydrogen, which they retain for a certain time.

2. Plunged into oxygen or hydrogen, platina plates acquire and preserve for some time a coating of these gases.

3. Plates thus treated and immersed in distilled water develop an electric current moving from the hydrogen to the oxygen plate.—*L'Institut; Philos. Mag.*

Chemical Science.

DIMORPHISM.

AMONG the more important labours of the British Association in 1837, and printed in the Society's volume of Reports of that year, is a paper by Professor Johnston, on a new and curious subject of chemical inquiry. The discovery that there exist definite chemical substances, which are capable, under certain conditions, of assuming more than one crystaline form, not deducible from, nor referable to, each other, and accompanied with different physical properties; and, furthermore, that there are instances of substances which are capable, (independently of any change of composition,) of undergoing some internal transmutation sufficient to vary even their chemical affinities: there are discoveries which pointing out a new road to the investigation of the hidden mysteries of molecular attractions, peculiarly deserve to be verified and extended. But, it so happens that they have been little studied or prosecuted in this country; wherefore, the Chemical Committee have selected this particular point as the subject of the Report on Dimorphism, printed in this volume; which gives a fuller statement than we before possessed, of the facts arrived at by foreign experimenters, the reasonings founded upon them, and the questions which are left for future inquirers to solve. This paper affords a good example of the objects aimed at in the Reports of the Association, which are not intended, like the articles in an Encyclopædia, to teach and diffuse science, but to *advance* it,—to shew what has been done with a specific view to what there remains to do.

GALVANIZATION OF METALS TO PREVENT THEIR OXIDATION.

M. SOREL, of Paris, has discovered the application of a scientific principle for preventing the oxidation or destruction of metals, particularly iron. His discovery is patented in France, and in the United Kingdom; and it has been submitted to the following eminent chemists: Messrs. Brande, Children, Graham, Garden, and Phillips. It consists in coating iron uniformly over with zinc, when the iron will remain untouched in acid liquids, so long as a particle of the zinc covering remains undissolved. The same protection is afforded in the open air. The zinc covering has the advantage over tinning, that although it may be worn off and the iron below it partially exposed, the iron is still secured from oxidation by the galvanic action, while the smallest quantity of zinc remains upon it; whereas tin in common tin-plate affords no protection of this kind, and not being absolutely impermeable to air and moisture, the iron under it soon begins to rust in a damp atmosphere. Such is a portion of the testimony of Professor Graham, who considers

this process of zinc-tinning "to be one of the most valuable economical discoveries of the present age."

Messrs. Children and Garden observe, that "the method adopted by Sir H. Davy for protecting the copper-sheathing of ships by means of some metal whose electrical relations are positive with respect to the copper, may have suggested the idea of a similar protection to iron; and it is obvious to theory, and demonstrated by fact, that zinc is an incomparably more powerful agent in producing that effect than tin. A material difference, however, exists between the French invention and that of Sir H. Davy, since the English philosopher employed *contact* of the metals only in protecting copper; whereas Monsieur Sorel avails himself of the chemical (or electrical) affinity of the metals in the most extensive and perfect contact in protecting iron."

Mr. Brande regards this discovery as "by far the most valuable practical application of the electro-chemical principle of the protection of metals which has hitherto been carried into effect." The French chemists, Messrs. Dulong and Dumas, alike testify the importance of this invention.

This process has, for some time, been worked in France, and a Company has been formed for a similar object in this country. Its application is: First, by coating iron with zinc in a fluid state. Secondly, by applying a paint made from zinc. Thirdly, by covering with a powder made from zinc. The process is cheaper than tinning. One of its most important applications is as a substitute for the sheathing of ships; the difference in the cost of a seventy-four-gun ship between iron and copper being, (according to the statement of the Company,) as £810 to £6,480.

ACTION OF SEA AND RIVER WATER ON IRON.

MESSRS. MALLET and DAVY have reported to the British Association some important results of their experiments, "On the Effect of Sea and River Water on Iron." They have come to results of great importance to the civil engineer, from which they find that pure oxygen and pure water are both neutral bodies in regard to iron, and only act on it together; that the larger the quantity of uncombined or suspended carbon in cast iron, the more is it acted on by these agents; so much so, that soft Scotch or Irish cast iron may be used to protect grey or chilled cast iron from all corrosion. With respect to the protection of iron by electro-chemical agency, zinc will only protect iron for a time: the oxide of zinc becoming transferred to the surface of the iron, when all protection is at an end. Brass, as proposed by Mr. Hartley, will not protect iron, and some specimens brought from the Liverpool Docks, shew the corrosion to have clearly been promoted by the adoption of this method.

EFFECT OF SALT WATER ON CAST IRON.

ON June 18, Mr. H. Wilkinson read at the United Service Museum, some observations "On the Effect produced on Cast Iron by the long-continued action of Salt Water." Cast iron, when exposed to the air, after long submersion, becomes red hot, and frequently falls to pieces. When first raised, it retains its form, but is reduced to the texture and weight of pumice stone. To the carbonic acid gas absorbed by the water, as well as to the saline substances it contains, Mr. Wilkinson attributes the action by which the iron is almost all absorbed, and a carbonaceous mass remains, which serves to defend a small quantity of iron in an almost atomic state of division from any further action. It is well

known that the metals, when minutely divided, have their affinity for oxygen so highly exalted, that they will take fire spontaneously in the open air. This is, therefore, the explanation of the phenomenon.—*Literary Gazette.*

CHEMICAL REACTIONS OF WATER.

M. KUHLMAN states one of the most remarkable chemical reactions of water is that which results from the contact of sulphuric acid with barytes. It is well known that this combination is sometimes effected with the extrication of so much heat, that the mass of barytes becomes red hot, and a part of the sulphuric acid escapes in the state of vapour. M. Kuhlman has found certain peculiarities respecting this combination, which appear to possess some scientific interest.

A. A fragment of barytes, put into contact with cold Nordhausen fuming sulphuric acid, occasioned immediate and very vivid action; which became still more vivid when anhydrous sulphuric acid, liquefied at about 77° Fahr., was employed.

B. A fragment of barytes, recently calcined, put into cold sulphuric acid, containing only one atom of water, of sp. gr. 1.848, suffered no alteration; no appearance of combination occurred. After remaining some time in contact, action suddenly takes place when the mixture is exposed to moist air; it may also be effected by slightly touching the barytes, moistened with sulphuric acid, with a hot iron, or a glass rod moistened with water.

C. A fragment of barytes was put into contact with sulphuric acid, of sp. gr. 1.848, to which a small quantity of water was previously added, and incandescence was the immediate result. The action is equally speedy when weaker sulphuric acid is employed, but no incandescence occurs.

D. Sulphuric acid of density 1.848, which did not act upon recently calcined barytes, acted energetically upon barytes which had absorbed a little moisture from the air.

E. Hydrated sulphuric acid, properly diluted so as to act immediately on barytes, does not act, when cold, if it is mixed with absolute alcohol or pyrolixic spirit.

From these different results, it may be inferred that hydrated sulphuric acid, containing only one atom of water, is with difficulty separated from it, and neutralizes in some mode the properties of the acid; for even in the presence of so powerful a base as barytes, the acid does not act without the assistance of heat.

It becomes very important to state exactly the density of sulphuric acid, when it is employed in chemical reactions; for, by the experiments above detailed, it appears that this acid combines energetically with barytes, when put into contact with this base at common temperature, in the state of anhydrous acid, fuming acid, or when weaker than 1.848, but it ceases to act when it is exactly 1.848.—*Ann. de Chimie; Philosophical Magazine.*

ULTIMATE ANALYSIS.

MR. RIGG, in his valuable observations on the Ultimate Analysis of Organic Compounds, states that "a very satisfactory mode of proving the correctness of the analysis of any compound is to repeat the experiment, and suffer the gaseous products to pass off in their moist state, and in

calculating the products of the analysis, to allow for the increase in volume by moisture."

"The results arising from my analysis of alcohol and æther do not favour the view which is very generally taken in the present day of the *vinous fermentation* and its products; to prove the inaccuracy of which it is only necessary to make experiments, and to examine them *in all their parts* with ordinary attention. Indeed, the erroneousness of the commonly received theory is evidenced by the combination of carbonic acid gas with vinous liquors, with æther and water, and with alcohol and water, when a compound very different from sugar is the product."—*Philosophical Magazine.*

CHEMICAL COMPOSITION OF THE ELECTRICAL APPARATUS OF THE TORPEDO.

M. MATTEUCCI has analysed the substance of the organ of a moderate-sized torpedo, after having removed all the membranes, muscles, and great nervous trunks which were attached to it. M. Matteucci commenced by determining the quantity of water it contained: first, he obtained from 1120 parts of the substance, 104 of dried product; in a second experiment, from 1307 he obtained 136 dried parts. The mean quantity of water thus amounts to 903-4 parts in 1000 of the substance of the organ. The analysis of the dried product was made by treating it with alcohol at 36°, and renewing this solution three times at intervals of twenty-four hours. The residue was then subjected to the same alcohol, but in a boiling state; which process was repeated twice. The remaining residue was then treated with boiling water, and afterwards with concentrated acetic acid. The result is as follows: 6.65 grains of the dried product gave

3.171	grains substance dissolved in cold alcohol	(A.)
0.893	——— in boiling water	(B.)
2.587	——— substances insoluble in alcohol	(C.)

The products A and B are composed of muriate of soda, of lactate of potash, of lactic acid, of Berzelius's extract of flesh, of phocenine, of a fatty substance analogous to the elaine of the brain, and lastly, of a fatty substance solid at common temperature. The product C is formed almost entirely of albumen and some traces of gelatine.

When the solution obtained with cold alcohol is evaporated, several crystaline layers are at first formed, subsequently some drops of a yellow oil; these sink to the bottom of the liquid. This liquid is very acid, and forms a precipitate with tincture of galls. On evaporating the whole of the solution, there remains a yellowish green mass, oily, very acid, and deliquescent. It dissolves almost entirely in water, forming a kind of emulsion. It disengages an odour of oil of rank fish. Potash dissolves the fatty substance, destroys the odour, and neutralizes the liquid; if tartaric acid be added, the fatty acid is again formed, and gives by evaporation and distillation, lactic acid and phocenic acid. The product of boiling alcohol also gives lactic acid and a solid fatty substance, which treated with nitric acid gives traces of sulphur and phosphorus. This substance insoluble is alcohol, boiled in distilled water, gives a dirty white solution, which becomes rather opaque by the bichloride of mercury; tincture of galls produces a flocculent precipitate, which is partly dissolved on heating the liquid. Lastly, the residue is soluble, especially in the hot process, in acids, and in acid alkaline solutions. It is nothing but pure albumen.

This substance, when dried, treated three times with cold æther, and the solution evaporated, yields a green fatty matter of a pearly appearance, which dissolves sparingly in æther and cold alcohol; it is void of taste, of a faint smell, and saponifies with potash; if burnt and calcined in a platina crucible, it leaves an acid cinder, and treated with boiling nitric acid it yields traces of the sulphuric and phosphoric acid. It is, therefore, cerebral stearine. The albuminous substance which surrounds the brain differs from the substance of the electrical organ only by its greater quantity of water. M. Matteucci concludes: "It would be impossible for me not to point out the analogy which exists between the composition of the cerebral matter and that of the electrical organ of the torpedo which we have analysed."—*From the Bibliothèque Universelle de Génève; translated by Mr. Francis, in the Philosophical Magazine.*

SPECIFIC HEATS OF GASES.

THESE have been investigated by Dr. Apjohn, whose conclusions are as follow:—1. That the simple law so much insisted upon in modern times by Haycraft, Marcet, Delarive, and others, that equal volumes of the different gases have the same specific heat, is not the law of nature. 2. The more limited conclusion of Dulong, that the simple gases have under equal volumes the same specific heat is, probably, not true in a single instance, and is altogether at variance with the results for hydrogen. 3. Their numbers correspond with those of de la Roche and Berard, except in the case of hydrogen, where the numbers of the latter are to that of the former as five to three. 4. There does not appear to be any simple relation between the specific heats of the gases and their specific gravities or atomic weights; and philosophers in searching for such are, probably, pursuing a chimera.—*Trans. Irish Acad.*

Scarcely had these experiments been published, when the death of that great philosopher, Dulong, was announced with the melancholy intelligence that he was cut off in the midst of researches upon this very subject. He left no instructions as to their progress, but among the cinders in the fire-place of his library was found a piece of paper containing figures, expressive of the two following laws, which must be added to that of the equality of the specific gravity of all the simple gases; a law, however, which is called in question by Dr. Apjohn:

1. Compound gases, formed of the simple gases, which do not condense in the act of union, have the same specific heat as the simple gases.

2. Compound gases, in the formation of which there has been the same condensation of the constituent gases, have the specific heats equal, although very different from that of the simple gases.—*L'Institut; Thomson's British Annual.*

SOLID, LIQUID, AND GASEOUS CARBONIC ACID.

M. THILORIER, of Paris, having contrived an apparatus, consisting of a retort and receiver, for the solidification of carbonic acid gas, through the liberal kindness of Professor Graham, Mr. Faraday was enabled to bring the subject of this lecture, illustrated by drawings, and by the action of the apparatus itself, before the Royal Institution, on the 18th of May. By the ingenuity of Thilorier, an additional interest has been given to this chemical compound, by the inquiring mind. By subjecting gases to great pressure, their elasticity is so far counteracted that they become liquid, ethereal, and volatile. The common process is to expose them

to the pressure of their own atmospheres. For instance, carbonate of soda and sulphuric acid mixed together in a perfectly close vessel (in a bent glass tube, hermetically sealed, the process may be witnessed), generate carbonic acid gas, which soon fills the vessel; and more and more, until by the reaction of the force to escape upon its own particles, by condensation, the gas becomes liquid. Upon this principle is the apparatus of Thilorier constructed, of very strong materials, sufficiently so to resist the pressure of more than ninety atmospheres; for such is the immense expansive force within the retort, by the action of a full charge of diluted carbonate of soda at a temperature of 100° Fahr. and sulphuric acid. Many successful processes, mechanical and chemical, have been made to liquefy carbonic acid gas, and in several of them a white powder had been observed; which, however, was allowed to pass away almost unheeded, until Thilorier contrived means to collect the snow-like substance, which he tested, and pronounced to be solid carbonic acid. The liquid from Thilorier's retort is distilled over into a receiver, fitted with stop cocks, leaden plugs, &c., and of like strength to resist the enormous pressure; and the solid is produced by the issuing of the liquid through a small vent from a pressure of about, in the experiment of the evening, fifty or sixty into that of only one atmosphere.

The liquid carbonic acid is highly volatile, and, therefore, by the rapid expansion and evaporation consequent upon its issue from the receiver, is capable of producing an intense degree of cold,—even 157° below 0° Fahr., or 189° below the freezing point of water—and, at 112° below 0° liquid carbonic acid freezes; hence solid carbonic acid. This substance, cold as it is, may be held in the hand with impunity, or retained in glass in the open air for a considerable time; because it immediately becomes surrounded by its own vapour, and is not in contact with the substance upon which it apparently rests. How, then, it is to be used as a cooling agent is a beautiful point. Two bodies, of widely different temperatures, are to be brought into contact by a third, which must be a good conductor of heat; and for this purpose æther is employed, because it will bear the contact, and still retain its liquid state. The innocent-looking mixture indicates none of its properties; but carbonic acid thus dissolved, and, consequently, not so cold as solid carbonic acid, cannot be touched with the same impunity; and any one would rue placing a finger therein: the effect would be the same as if it were plunged in melting metal. Mercury placed in it was immediately frozen, and, taken out, was cut like lead with a knife.

Mr. Addams has exhibited to the British Association two instruments, (extensive and ingenious improvements upon Thilorier's apparatus,) for the purpose of liquefying and solidifying carbonic acid gas. One consists of brass, and the other of iron, with the power of resisting a pressure on their inward surface of 300 atmospheres, or two tons to the square inch. —*Literary Gazette.*

Mr. Addams announced his intention of examining the pressures at higher temperatures, up to that of boiling water, and above; and asserted his belief that it may be profitably employed as an agent of motion—a substitute for steam—not directly, as has already been tried by Mr. Brunel, but indirectly, and as a means to circulate and reciprocate other fluids. The solidification of the acid was shewn, and the freezing of pounds of mercury in a few minutes, by the cooling influence which the solid acid exercises in passing again to the gaseous state.—*Athenæum.*

EASY METHOD OF APPLYING SULPHURETTED HYDROGEN GAS AS A TEST.

TAKE a test tube, an inch wide, and six inches long. Put into it half a grain of sulphuret of iron, or sulphuret of antimony, and two or three drops of muriatic acid. Insert into the mouth of the tube a slip of white paper, three inches long and half an inch wide, wetted with the solution under examination previously acidified. Allow a portion of the paper to project beyond the tube and secure it by inserting a cork. Warm the bottom of the tube over a spirit lamp. The action of the gas on the solution is manifested by the change produced in the colour of the paper. You have only to distinguish between black and yellow, and between no change, black, yellow, and orange, all of which are easily perceived upon white paper, and this mode of testing will accomplish the object equally well as the more operose and disagreeable methods in common use.—*Philosophical Magazine; J. J. Griffin, author of "Chemical Recreations."**

NITROGEN IN PLANTS.

ON May 31, was read to the Royal Society "An Experimental Inquiry into the Influence of Nitrogen on the Growth of Plants;" by Robert Rigge, Esq. The experiments are arranged in separate tables so drawn out as to indicate not only the quantities of carbon, oxygen, hydrogen, nitrogen, and residual matter, in about twenty different vegetable substances, but also the quantity of nitrogen in each compound, when compared with 1,000 parts by weight of carbon in the same substance. The most important of these tables are those which exhibit the chemical constitution of the germs, cotyledons, and rootlets of seeds; the elements of the roots and trunks of trees, and the characters of the various parts of plants, especially of the leaves, at different periods of their growth. It was found that the germs of beans, peas, barley, and wheat contained 200 parts of nitrogen, and 1,000 of carbon, while the cotyledons had not more than one half. It was uniformly found that barley and other grains germinated earliest when containing the largest quantity of nitrogen; this quantity being always greatest in spring, and a powerful agent in the chemical action going on in the growth of the plant. An excess of nitrogen is always found in sap-wood, and largest in those timbers which grow the quickest, and smallest in hard woods: for example; in satin-wood, it is almost inappreciable; so, likewise, in Malabar teak, and in good old English oak, it is very small.

On June 21, the author followed up his inquiry, by experiments, in which he attempted to shew that the differences which we find in the germination of seeds and the growth of plants in the shade and sunshine, are apparently due, in a great measure, to the influence of nitrogen.

From this extensive series, which is stated to form but a small portion of the experiments made by the author in this department of chemical research, it appears that nitrogen and residual matter are invariably the most abundant in those parts of plants which perform the most important

* Of this valuable "Compendium of Experimental Chemistry," Mr. Griffin has published in the past year, the first portion of the eighth edition; comprising Chemical Manipulation, and Blowpipe Analysis. The remaining portion:—I. A Course of Testing.—II. Systematic Chemistry, will appear shortly. The success of the "Chemical Recreations" is altogether merited; for few works have in their progress to popularity exhibited such well-directed efforts to obtain it.

offices in vegetable physiology; and hence the author is disposed to infer that nitrogen (being the element which more than any other is permanent in its character) when coupled with residual matter, is the moving agent, acting under the living principle of the plant, and moulding into shape the other elements. The method of ultimate analysis adopted by the author, enables him, as he conceives, to detect very minute errors, and therefore, to speak with certainty as to the accuracy and value of every experiment.—*Philosophical Magazine.*

ACTION OF FERMENTATION ON A MIXTURE OF OXYGEN AND HYDROGEN GASES.

M. THEOD. DE SAUSSURE observes: it is well known that the quantity of hydrogen gas contained in the atmosphere does not amount to one one-thousandth of its volume. Nevertheless, the decomposition of organic matters continually adds fresh quantities of this gas to atmospheric air; on the other hand, there are few substances which occasion the combination of hydrogen with oxygen at common temperatures; and the circumstances which the combination requires, prove that the disappearance of the hydrogen cannot be accounted for in this way. M. de Saussure states that he has found the combination to be effected by the fermentation of organic substances universally distributed over the surface of the soil, even when on account of the smallness of their quantity and the slowness of their operation no rise of temperature takes place.—*Bibliothèque Universelle; Philosophical Magazine.*

NEW HOT SPRING AT CARLSBAD.

THE subterraneous hot water of Carlsbad has found a new issue in the square of that town. Dr. Wolf and Mr. J. Knewkowsky have analysed the water of this new spring, and have found in it both bromine and iodine, the presence of which elements in the water of Carlsbad was first discovered by Professor Pleisdel.—*Mag. Nat. Hist.*

NEW CARBURET OF HYDROGEN.

A NEW carburet of hydrogen has been extracted in France from the oil of potatoes. It consists of eighty-six of carbon and fourteen of hydrogen, and the density of its vapour is 5.06.

LIQUEFACTION OF HYDROGEN AND OXYGEN.

MR. MAUGHAM has exhibited to the British Association an apparatus which he has employed in attempting to liquefy oxygen and hydrogen. It consists of a strong bent glass tube, having platinum cones passing in at each end. Water being placed in the tube, and the latter being closed, the wires are to be connected with a sustaining voltaic battery. The water is decomposed, and the liberated gases, hydrogen and oxygen, are retained in a separate state at each end of the tube. By this method, an unlimited extent of atmospheric pressure is obtained upon the enclosed gases.—*Athenæum.*

ARTIFICIAL PEARLS.

IT has been suggested that the pearly lustre of the crystals of certain salts, especially the double cyanides, is so beautiful, that their employment might supersede the cruel practice of stripping the scales from living fish,

for the manufacture of artificial pearls. Oxalic acid may be formed by the action of nitric acid upon alcohol, under certain conditions, in pearly scales.—*Proceedings of the British Association.*

ASPHALTIC MASTIC.

THE asphaltic mastic is obtained from Pyrmont, near Seyssell, and brought down the Rhone. It is a compound of a carbonate of lime and mineral pitch. After being roasted on an iron plate, it falls to powder, or may be readily pounded. By roasting, it loses about one-fortieth of its weight. It is composed of nearly pure carbonate of lime, with about nine or ten per cent. of bitumen. When in a state of powder, it is mixed with about seven per cent. of a bitumen, or mineral pitch, found near the same spot. This bitumen appears to give ductility to the mastic. The addition of only one per cent. of sulphur makes it exceedingly brittle. The powdered asphaltic is added to the bitumen when in a melting state; also, a quantity of clean gravel, to give it a proper consistency for pouring into moulds. When laid down for pavement, small stones are sifted on, and this sifting is not observed to wear off. The mass is partially elastic, and M. Simens has seen a case in which a wall having fallen away, the asphaltic stretched, and did not crack. It may be considered as a species of *mineral leather.* The sun and rain do not appear to have any effect on it; it answers exceedingly well for the floors of the abbatoirs of the barracks in France, and keeps the vermin down; and is uninjured by the kicking of horses. It may be laid down at from eight pence to nine pence per square foot.—*Railway Magazine.*

SULPHUR.

M. MARAVIGNO, Professor of Chemistry in the University of Catania, (who possesses a very numerous collection of the crystalized sulphur of Sicily,) refers the formation of this substance to the period of secondary rocks. He disputes the assertions of Professor Gemellaro, who contends that sulphur owes its origin to the decomposition of mollusca. He considers, that, whilst the secondary formations were being deposited, the currents of acid hydro-sulphuric gas, from the interior of the earth, came in contact with the blue marl, held in suspension in water, and that the acid, in decomposing, produced deposits of sulphur, which are still found mingled with the marl. He notices the deplorable system still used in Sicily for extracting sulphur, in which he says that seventeen parts are lost out of eighteen. He then describes the different forms which the crystals present, the first of which has been discovered by him: it is that of a straight rectangular prism, the solid angles of which are truncated, and replaced by triangular facets.—*Athenæum.*

THEORY OF RESPIRATION AND ANIMAL HEAT.

ON June 21, was read to the Royal Society a series of experiments on the above inquiry, tending to shew that the lungs are absorbing and secreting, and perhaps also inhaling organs; and that their peculiar function is to introduce oxygen into the blood, and separate carbonic acid from the blood: and they favour the idea that animal heat is owing, first, to the fixation or condensation of oxygen in the blood in the lungs during its conversion from venous to arterial; and secondly, to the combination into which it enters in the circulation in connexion with the different secretions and changes essential to animal life.—*Philosophical Magazine.*

COMPOSITION OF THE BLOOD.

M. LECANU states that venous blood of man may be considered on an average as composed of

Serum	869.1547
Globules	130.8453
	1000.

Or of

Water	790.3707
Oxygen, Azote, Carbonic Acid, Extractive Matters, Phosphorized Fat, Cholactrine, Serolin, Free Oleic Acid, Free Margaric Acid, Hydrochlorate of Soda, Hydrochlorate of Potash, Hydrochlorate of Ammonia, Carbonate of Soda, Carbonate of Lime, Carbonate of Magnesia, Phosphate of Soda, Phosphate of Lime, Phosphate of Magnesia, Sulphate of Potash, Lactate of Soda, Salt of fixed fat Acid, Salts of volatile fat Acid, Yellow colouring matter	10.9800
Albumen of the Serum	67.8040
Globules	130.8453
	1000.

The globules are stated to be composed of

Fibrin	2.9480
Hæmatosin	2.2700
Albumen	125.6273
	130.8453

Annales de Chimie; Philosophical Magazine.

MICROSCOPIC EXAMINATION OF THE BLOOD IN DISEASE.

ON June 14, Mr. George Gulliver, Assistant Surgeon to the Royal Regiment of Horse Guards, read before the Royal Society some important researches on Inflammation and Suppuration. The result has been the detection of pus in the blood in almost every instance in which there was either extensive suppuration, or great inflammatory swelling without a visible deposition of pus in any of the textures of the body; and the contamination of the blood by pus appears to Mr. Gulliver to be the proximate cause of the sympathetic inflammatory, sympathetic typhoid, and hectic fevers.

The examination was very simple, partly chemical, and partly by the aid of the microscope. Those who are acquainted with the minute constitution of the animal fluids, are aware of the rapid and energetic action of water on the blood corpuscles. Now the globes of pus undergo no change after having been kept long in water; accordingly, if the sus-

pected blood be mixed with this fluid, the blood corpuscles will become invisible, and any globules of pus that may be present will subside to the bottom of the vessel, and may easily be seen, and their characters determined by a good microscope. Ammonia instantly renders the blood corpuscle invisible, while that of pus is acted on but slowly by the alkali; and the different action of acetic acid on pus and blood is equally remarkable. Hence Mr. Gulliver has employed these agents advantageously in conjunction with the other means; and he has also seen pus globules in the blood, though rarely, without any preparation. With water, however, the examination is most easy, simple, and satisfactory, if the observer be thoroughly familiar with the microscopic character of the fluids under examination. A good instrument, nevertheless, is necessary; and the admirable deep object-glass of Mr. Ross was that employed by Mr. Gulliver. It is hardly necessary to add, that chyle globules are not likely to be mistaken for those of pus, since, independently of other distinctions, the medium diameter of the latter is at least one two-thousand six hundred and sixty-sixths of an inch, which is above twice that of the former.

Mr. Gulliver then details eleven striking instances in which he has found pus in the blood. The accuracy of his observations are next confirmed by those of Dr. Davy, who has found pus in the blood in seventeen instances after death, in sixteen of which there was declared suppuration. Mr. Gulliver adds: "Since the microscopic observations of Mr. Hunter, Sir Everard Home, and Mr. Bauer, the opinion has often been expressed in this country, that the globules of pus are nothing but those of the blood, modified by the inflammatory process. I believe Sir Astley Cooper and the late Dr. Young came long ago to this conclusion. Finally, on the Continent, Mr. Gendrin, without much regard to the observations of English pathologists, adopts precisely the same theory, supported indeed by a series of very ingenious experiments, which have been considered conclusive on this subject."

Amongst Mr. Gulliver's conclusions, he observes: That it is probable "suppuration is a sort of proximate analysis of the blood; and that, if the presence of pus in the blood and the fever in these cases be not related as cause and effect, the coincidence would appear to be no less interesting than remarkable. What a field of inquiry this view opens to us! Henceforth, whenever a patient is affected with inflammatory fever, or that low typhoid state which is so generally a forerunner of death, as a consequence of traumatic or idiopathic inflammation, the state of the blood will present an interesting subject of investigation. The question will then arise, whether, in the treatment of such cases, it would be not advantageous to produce suppuration as soon as possible on the surface of the body, so as to establish a drain by which the blood might be deprived of the offending matter. It may be asked also, whether the benefit so often effected by blisters, setons, and issues, in certain internal inflammations,—or by incisions, which cause suppuration, in inflammatory affections of the integuments,—be not explicable by this theory.

Mr. Gulliver hopes that his paper will lead to a still more careful and extensive examination of the blood in various diseases than has hitherto been attempted. "The microscope may become as important an instrument to the pathologist, and even to the medical practitioner, as the stethoscope. If my results should be confirmed, it is hardly too much to expect that some important discovery, particularly in diagnosis,

may be made by a patient examination of the blood in many malignant diseases, such as cancer: it is not long since the urinous fever, as it is called, was found to depend on the accumulation of urea in the blood."

ANALYSIS OF METEORIC IRON.

Mr. Charles Jackson has analysed a remarkable specimen of meteoric iron, from Clairborne, Clarke county, Alabama; and has communicated the results to Silliman's *Journal*. On examination, this substance soon appeared to be different from any metallic substance of terrestrial origin, and to be a very peculiar meteorite. From the above analyses, specimen 1st, having a sp. gr. of 5.750 contains in 25 grains:

Metallic Iron	16.296=65.184	per cent.
Nickel	6.927=27.708	

Specimen 2, having a sp. gr. of 6.500 in 50 grains, or in 100 grains:

Metallic Iron	33.280=66.560	per cent.
Nickel	12.354=24.708	
Chrome and Manganese	1.625= 3.240	
Sulphur	2.000= 4.000	
Chlorine	.740= 1.480	
	49.999 99.988	

This meteorite contains an unusual proportion of nickel; and chlorine, in matter of celestial origin, is here noticed for the first time; though its occurrence may have been overlooked in former analyses of meteorites. It is a fact of great importance, in accounting for the chemical phenomena of meteorites, while passing through our atmosphere. It must also be remembered, that chloride of iron is readily volatilized at a high temperature, and *that it is abundantly exaled from the craters of volcanoes*, in various parts of our planet. Mr. Jackson adds: "Nickel, however, has not, to my knowledge been discovered amid volcanic sublimations, but it may be worth while to call the attention of chemists to the subject, that it may be sought for in volcanic craters. I am, nevertheless, far from believing that we shall be able to prove that all meteorites originate from volcanic sublimations; for there are very evident reasons to believe that our planet, statedly in its course, passes amid numerous detached masses of matter or asteroids, which regularly meet the earth in its orbit on November 13th; at least, such are the views of Professor Olmsted, of Arago, of Gay-Lussac, whose opinions appear to be supported by the facts which they have collected.

"Allowing that meteoric matters are projected from cometary masses, which statedly cross the earth's orbit, coming within the limits of its attraction, and are subjected to the oxidizing influence of the atmosphere, so as to take fire and fall in burning masses upon the surface of the earth, we can more readily account for the phenomena exhibited in their splendid coruscations, when we know that the meteors contain ingredients possessing remarkable decomposing powers, if brought into contact with water or aqueous vapour; and such are the effects of the chlorides of iron and nickel."

Mr. Jackson concludes, that if we consider the chemical composition of this specimen, we are forced to regard it of celestial origin; for we have no similar *natural* alloy in this world, and it contains elements, which are generally found in meteoric matters besides, the new ingredient which Mr. Jackson has discovered as one of its components. It is clearly impossible that this mass should have been factitious; for in all manufactured iron, we can readily detect carbon, which does not

exist in our specimen, and the situation in which it was found is presumptive evidence that it was not manufactured; whilst the rocks around not belonging to the class bearing metallic ores, it is impossible for it to have been derived from them; and it could not have been derived from the distant rocks by diluvial transportation, for no such ores exist in any of our mines. Had it been an ore of iron, reduced by a blast of lightning, we should not have found it alloyed with nickel.—*Abridged from the Philosophical Magazine.*

REDUCTION OF METALLIC POISONS. (*Arsenics.*)

GÖBEL has found that formate of soda furnishes the most ready means of reducing metallic poisons, not only when in the state of oxides but as sulphurets, and is, therefore, of extreme importance in researches connected with medico-legal inquiry. The substance to be examined is mixed with the formate and heated in the usual manner in a small glass tube, over the flame of a lamp; the arsenic, if present, of course, sublimes. In this way, Göbel has detected the presence of orpiment in the golden sulphuret of antimony, when present only in the proportion of one part to 1,000 of the antimonial sulphuret.—*Jahres—Bericht der Phys. Wissenchaften; Philos. Mag.*

SENSITIVE PAPER: NEW PROPERTY OF THE IODIDE OF SILVER.

MR. H. F. TALBOT, F.R.S. has noticed in the *Philosophical Magazine*, a remarkable property of iodide of silver changing colour when heated, and recovering it when cold; a fact which he believes is not mentioned by any chemical author, and which he illustrates in the following amusing experiment.

Wash over a sheet of white paper with a solution of nitrate of silver, and afterwards with a *rather dilute* solution of hydriodate of potash. It will immediately assume a pale yellow tint, owing to the formation of iodide of silver; and the paper may then be laid aside for use.

To exhibit the sensitive property in question, hold the paper for some moments before a hot fire, and its colour will change from a pale primrose tint to a rich gaudy yellow, emulating the sunflower. Remove the paper from the fire, when the bright colour will gradually fade, and in three or four seconds entirely disappear. It may then be reproduced, and again destroyed as before, and so on for any number of times, for the heat causes no alteration in the substance experimented upon.

If the finger be pressed upon the paper in its warm and yellow condition, and quickly removed, it will leave a print of its form, which will be nearly white: for the finger is a much better conductor of caloric than the atmospheric air, and therefore, *instantly* cools the paper. Any cold substance may be substituted for the finger; and the effect can be produced at a little distance without actually touching the paper, merely by the radiation of the cold body.

Mr. Talbot has kept some pieces of this prepared paper for a year, and finds that it still remains as sensitive as ever; and, from the peculiar suddenness with which it changes colour, it is well adapted for experiments on the radiation and conduction of heat.

NEW PROPERTY OF NITRE.

PUT a drop of solution of nitre on a small plate of glass, and evaporate it to dryness over a spirit-lamp; then invert the glass, and hold it with the salt downward, and in contact with the flame. By this means the nitre

may be brought into a state of fusion, and it will spread itself in a thin transparent film over the surface of the glass. Removed from the lamp it immediately solidifies, and the film in cooling, cracks irregularly. As soon as the glass is cool enough, place it beneath the microscope, the polarizers being crossed, and the field of view, consequently, dark. We shall observe the following phenomena. First, the nitre appears very luminous; a proof that it is in a crystaline state, and not amorphous, as (after fusion) we might have expected to find it. The crystaline structure of the fused nitre is *perfect;* that is to say, the film appears very luminous, and *uniformily* so, as if it were a thin slice from a large crystal of the substance.

From this experiment, which has been communicated to the *Philosophical Magazine*, by Mr. H. F. Talbot, F.R.S., it appears to follow as a consequence, that the crystalization of melted nitre does not take place in the usual way by the formation of a primitive nucleus and the deposition of layers of molecules upon it; but that we have here a new sort of molecular action brought into evidence, by means of which considerable portions of crystal are *formed at once*, and pass from the fluid into that of a crystaline solid with an axis in a determinate direction; a result which Mr. Talbot considers to have an immediate bearing upon the fundamental doctrines both of double refraction and of crystaline structure in general, and to require that some modifications should be made in the received theory on those subjects.

Mr. Talbot details another property of nitre, equally remarkable with the foregoing: when the crystaline film being darkened, let the observer touch the film with the point of a needle, while he is observing it in the microscope, and he will perceive the touch immediately to produce a luminous spot on the dark surface, and the spot to slowly expand in all directions like a luminous wave; whilst in four or five minutes, the whole field of view becomes metamorphosed from a space almost entirely dark, into a luminous one, mottled with all manner of colours; and, if the film be not touched, the same change will take place *spontaneously* a few minutes later. But, if it be touched the first minute after it has become solid, the above change will not take place. We may *then* trace lines or letters upon the darkened film with the point of a needle, and these lines will appear luminous, in consequence of the crystaline particles which the needle displaces being thrown into such positions as to depolarize the light, without disturbing the rest of the field of view, which, however, at length, changes spontaneously.

The cause of this beautiful phenomenon Mr. Talbot considers to be the condition of mutable equilibrium which nitre assumes at the temperature at which it first solidifies after fusion.

TUNGSTATE OF TUNGSTEN AND POTASH.

M. LAURENT has prepared this salt by the method employed by M. Wæhler for the corresponding salt of soda. This tungstate crystalizes in small needles, whilst the soda salt is in small cubes.

M. Laurent states that the colour of this salt is extremely beautiful: it is of a deep coppery violet colour and very brilliant in the sunshine; it very perfectly resembles sublimed indigo; and what is remarkable, when burnished it becomes like indigo, of a fine blue with coppery reflections. The corresponding salt of soda, whatever may be its colour, becomes blue by friction.

NEW DOUBLE SALT OF ZINC AND POTASSIUM.

WHEN a solution of iodide of potassium is mixed with one of nitrate of zinc, a yellowish crystaline deposit of iodide of zinc falls, which dissolves on the addition of an excess of iodide of potassium, and by evaporation crystalizes in colourless octohedral or rhombic crystals, which are not altered by exposure to the air, and contain iodine, nitric acid, zinc, and potassa. By exposure to heat, this salt evolves iodine, then nitrous acid, oxide of zinc and potassa being left: it is readily soluble in water, insoluble in alcohol; and precipitates iodine from its solutions, tartaric acid separating bitartrate of potassa.—*Buchner's Repertorium; Philosophical Magazine.*

XYLOIDINE: NEW PARCHMENT.

M. PELOUZE has lately investigated this substance, which, although discovered by Braconnot several years since, had hitherto been but imperfectly described.

Xyloïdine is produced by the action of nitric acid upon starch and lignin. If nitric acid of sp. gr. 1.5 be added to starch, in a few minutes the starch will disappear; the liquor will preserve the yellow tint of concentrated nitric acid, but no gas will be disengaged: when immediately treated with water, xyloïdine is precipitated, and the filtered liquor leaves scarcely any residue. The xyloïdine is then common starch, in which an atom of water is replaced by an atom of nitric acid. The starch is entirely converted into this substance; and this perfectly explains the considerable increase of weight which is found when the xyloïdine is precipitated by water immediately after the disappearance of the starch in the nitric acid: but, if the precipitation be long delayed, not the slightest trace of xyloïdine is obtainable; it being converted into a new acid, which is, by evaporation, procured in the form of a white, solid, uncrystalizable deliquescent mass, the weight of which is much greater than that of the starch submitted to experiment. This result differs from that obtained by M. Braconnot, who procured an equal weight of xyloïdine from a given weight of starch, which, according to M. Pelouze, was occasioned by the decomposition of a portion of it.

Xyloïdine is then a kind of salt in which starch acts the part of base to the nitric acid. It is very combustible; at 236° Fahr. it takes fire and burns vividly, leaving but little residue. This property led M. Pelouze to remark an important fact, which appears susceptible of several applications, particularly in artillery. By plunging paper into nitric acid of sp. gr. 1.5, leaving it to soak for two or three minutes, then taking it out, and washing it in water, a kind of parchment is obtained, which is water-proof, but extremely combustible; the same effect being also produced on linen and cotton.—*L'Institut: Philosophical Magazine.*

NEW COMPOUND.

ON April 23, Dr. Apjohn communicated to the Royal Irish Academy a paper upon the subject of a new and very complicated compound, consisting of iodine, iodide of potassium, and the essential oil of cinnamon. This compound he stated to have been first observed in 1837, in a solution prescribed by a medical gentleman of Dublin, of iodine and iodide of potassium in cinnamon water. It is best obtained by adding to a gallon of cinnamon water four ounces of iodide of potassium, and forty grains of iodine, dissolved in a minimum of cold water. Upon admixture, the

solution becomes turbid, and, if the temperature be at or close to 32°, the deposit becomes crystaline, and slowly subsides. The properties of these crystals were detailed, and a succinct account given of the different steps of the process employed for effecting their analysis. As the result of several experiments, the author arrived at the following numbers, expressing the composition of 100 parts of the compound :

Iodine of potassium	12.55
Iodine	28.14
Oil of cinnamon	59.31
	100.

This compound he considered interesting under many points of view; in consequence of its complexity, the peculiarities of its properties, and its presenting a case of incompatibility which had not been previously suspected. Also, as suggesting means which would probably lead to the production of an entire new series of substances having an analogous composition. Of the specimen exhibited to the Academy, sixty-one grains were obtained from a single gallon of cinnamon water.—*Athenæum.*

BICHROMATE OF PERCHLORIDE OF CHROMIUM.

M. R. WALTER gives the following process for preparing this remarkable compound: put into a tubulated glass retort an intimate and finely powdered mixture of 100 parts of fused common salt, and 168 parts of neutral chromate of potash; an S tube is to be put into the tubulure of the retort, through which there are gradually poured 300 parts of concentrated sulphuric acid. The action is rapid from the commencement: intense red vapours, accompanied by much chlorine, being disengaged. The receiver is to be kept cold to condense the vapour. The acid must be gradually added, otherwise a loss of the red vapours will take place, and the contents of the retort will rise and pass into the receiver. As soon as the acid is added, gently heat the retort, and increase the heat until yellow vapours begin to arise, when the operation will be finished. In the receiver will be found a liquid of an intense red colour, and a solid substance, which, according to M. Dumas, is a compound of this substance with chlorine. By decantation, they may be separated, and the liquor, when rectified, so as not to obtain the whole of it, yields a compound, the boiling point of which is constant. The liquor thus obtained is of a magnificent blood-red colour; it is volatile, and yields fumes abundantly; when put into a quantity of water, it falls to the bottom in drops of an oily appearance, and is converted into chromic and hydrochloric acids. Its boiling point is 244° Fahr., and its specific gravity is 1.71; it acts rapidly on mercury; it is decomposed by sulphur, detonates with phosphorus, dissolves chlorine and iodine, and combines with ammonia with the disengagement of light. A small quantity mixed with concentrated alcohol combines with it in violent explosion, and the inflamed alcohol is projected with force. This unexpected action had nearly deprived M. Walter of his sight, and burnt him horribly.—*Ann. de Chimie ; Philosophical Magazine.*

The above process under the microscope presents one of the most beautiful objects ever seen. Put a very small portion of the muriate of soda on a thin flat glass, and add to it a drop of strong solution of bichromate of potass; lay this on the post-object, and adjust it to the focus of the microscope. Then place upon another flat glass a drop of sulphuric acid, and turn it down upon the other glass. The action commences.

The sulphuric acid is seen attacking and breaking down the muriate of soda, and setting free the muriatic acid. Crystals of sulphate of soda are speedily formed. The sulphuric acid acts also on the bichromate of potass, and sets free the chromic acid; and crystals of sulphate of potass are formed. Over these crystals of both kinds a multitude of green particles are observed, which are, probably, a chromate of potass, formed from one equivalent of chrome in the bichromate; and the other equivalent of the chrome combines with the disengaged chlorine, and appears in large blood-red globules over the whole field. The operation, when steadily watched, is very beautiful; and it is one in which the microscope seems to develop with peculiar interest a process whose specific features are lost sight of in the retort.—*Mr. E. Craig; in Philos. Mag.*

GALACTIN OF THE COW-TREE.

Dr. Thomas Thomson has communicated to the British Association an account of this substance, which constitutes the principal substance in the sap of the cow-tree, or *galactrodendon utile* of South America, where it is used as a substitute for cream. The sap, on standing, throws up a white matter, soluble in boiling alcohol, but deposited as that liquid cools. When well washed, and dried *in vacuo,* over sulphuric acid, it constitutes galactin. It is yellow, translucent, brittle, has a resinous aspect, and is tasteless. It is insoluble in water, but becomes white and soft by boiling in that liquid. It is soluble in alcohol and æther. This white compound becomes soft and ductile at 60°; at 117° it is still solid, but at 137° it is liquid. Abundance of aqueous vapour is driven off, but the galactin does not become translucent and yellow till kept some time at 170°. The specific gravity of pure galactin is 0.969. It dissolves readily in oil of turpentine and olive oil. It does not combine with potash, nor form a soap. Its constituents are—

6 atoms carbon	= 4.5, or per cent. ...	72
6 ...... hydrogen	= 0.75	12
1 ...... oxygen	= 1	16
	6.25	100

being isomeric with Brazil wax, which does not, according to Mr. Brande, form a soap with potash.—*Athenæum.*

NEW ACID FORMED BY THE COMBINATION OF ALCOHOL AROUND AN INCANDESCENT PLATINA WIRE.

M. Leroy states that this acid is liquid, and of a consistence similar to that of oil of almonds or olives, and that it is perfectly limpid. It is greasy and unctuous to the touch; it spots paper like a fat substance, and the spot remains for a shorter or longer time, according to the temperature. It has a slight smell when totally freed from acetic acid. This odour is peculiar and not at all aromatic; it has a bitter taste; its after taste is sharp and resembles that termed *metallic.* Its specific gravity at 47° Fahr. is 1.1315; it is slightly volatile, and reddens litmus paper strongly.

The chemical properties of this acid are, that it boils between 122° and 131° Fahr., and gives off pungent vapours which affect the eyes. It is, however, less volatile than water and concentrated acetic acid; it becomes more viscid at a few degrees below 32°, and is nearly as thick as soft butter. Light does not seem to act upon it. When kept in half filled bottles, this acid appears to be converted into very concen-

trated acetic acid and a volatile product. Do these result from the absorption of oxygen? It combines with water in all proportions; the solution reddening litmus paper strongly.

When this acid is put into contact with fine crystals of nitrate of mercury, the mixture becomes milk-white; but, if heated to a temperature between 140° and 160°, ebullition occurs, vapours are given off which affect the eyes very powerfully, and a globule of a greyish blue colour soon forms at the bottom. This globule, says M. Leroy, seems to be cemented by a fatty matter, and on examining it with a strong glass, small brilliant points were perceptible, which appeared to be globules of mercury. When a lighted taper is presented to this acid, it burns with a white flame.—*Journal de Chimie Medicale; Philosophical Magazine.*

PREPARATION OF BICARBONATE OF POTASH.

CARBONATE of potash, both in the dry state, and in solution, combines very slowly with the second equivalent of carbonic acid to form the bicarbonate of potash. By means of charcoal in a finely divided state, the combination may be facilitated: bitartrate of potash is to be heated in a covered crucible, the burnt mass to be moistened with water, put into a receiver, and carbonic acid passed through it. The absorption takes place with such rapidity that the mass becomes strongly heated, so much so that it is necessary to surround the receiver with cold water to prevent the reconversion of it into carbonate of potash. The saturation is complete when it ceases to give out heat. It is then dissolved in the smallest possible quantity of water at the temperature of 100° to 120° Fahr.; and upon the cooling of the filtered solution, the greater part of the bicarbonate separates in fine crystals.—*Prof. Wæhler in Poggendorf's Annals; Philosophical Magazine.*

LEAD.

CHEMISTS have long turned their attention towards the different combinations of water and acetic acid with oxide of lead, and which are so valuable to medicine, to the arts, and to analysists; but the subject is still incomplete. M. Payen, however, has been making some important progress in this branch of chemistry, and the most interesting part of his labours consists in the discovery of a new acetate of lead, and an equally new combination between water and protoxide of lead. In the course of his researches, he has been able to explain several phenomena, the causes of which have been hitherto unknown, and which are highly interesting in the matter of analysis.—*Athenæum.*

PREPARATION OF THE PROTOXIDE OF TIN.

MR. S. A. SANDALL, of St. Thomas's Hospital, finds the following process to be that which yields the purest oxide. Prepare a solution of protochloride of tin by dissolving the metal in hydrochloric acid, taking care always to have a great excess of the tin; evaporate the solution to dryness, together with a lump of tin to prevent the formation of perchloride. Then separate the tin, weigh the chloride, and rub it in a mortar with its equivalent, or rather more, of crystalized carbonate of soda; the mixture will soon become fluid, when put it into an evaporating dish, and heat it on the sand bath, frequently stirring it, till it becomes thoroughly black; then remove it, well wash it with boiling water, filter it, and dry it at a gentle heat, on the sand-bath. The oxide thus prepared is of a beautiful blue black or slate colour; it is very soluble in hydrochloric acid, and

when heated to dull redness in the air, it takes fire and burns, and is converted into peroxide.—*Philosophical Magazine.*

ACTION OF NITRATE OF SILVER.

Dr. R. D. Thomson has read to the British Association a paper "On the Modus Operandi of Nitrate of Silver as a Caustic and Therapeutic Agent." It was stated that light had no power whatever in decomposing nitrate of silver. In every instance in which this apparently occurred, it had been previously rolled in paper, which afforded an opportunity for it to combine with organic matter, and thus produce the effect upon which the general opinion was founded. A specimen of pure nitrate of silver, placed in a tube hermetically sealed, was exposed on the top of a house for a considerable period without the slightest discolouration. To illustrate the action of nitrate of silver when applied to the skin, or a diseased surface, Dr. T. added a solution of this substance to a solution of white of egg or albumen; he found that two distinct compounds resulted, one soluble, the other insoluble in water. He contended, that these compounds were formed when it was applied to an organized surface, and that, they being removed, the caustic effect was thus produced; and that, in the internal use of this substance, the doses which could be administered in safety were proportioned to the quantity of albuminous matter contained in the stomach; and that in the event of a deficiency, the coats of the stomach would be acted upon in the same manner, and death ensue; but that it was impossible for the substance unchanged to become mixed with the blood, and deposited on the surface, as was generally believed.—*Athenæum.*

ADULTERATION OF CARMINE.

M. C. G. Ehrenberg states: there occurs in commerce a kind of very fine coloured and very expensive carmine in the form of cakes, which owes its fine colour to an adulteration. Upon being used for ordinary painting, no difference has been observed; but by the microscope it may be discovered that half of it consists of starch (wheat starch), which imparts to the finely divided carmine a clear ground and a brilliancy highly increasing the appearance of the colour. When such carmine is mixed with much water, it diffuses itself throughout, and is for a long time suspended; but on pouring off the water a white sediment remains similar to white lead. This sediment is starch. Besides this distinct form and size of an amylaceous body when it is examined by its reaction upon tincture of sodium, it produces the well-known blue colour. This sediment, when heated with water, forms a paste. The addition of white lead is detected by its weight, but the addition of starch is not so easily discovered; by means of the microscope the adulteration may be with certainty recognised, and confirmed by chemical examination. It may be, perhaps, interesting for the artist to know that few colours of this description, mixed with an organic body, although generally pretty permanent, yet in a damp atmosphere are very liable to decomposition. In regard to its covering properties, starch differs considerably from white lead. It covers less on account of its transparency.—*Poggendorf's Annals; Philosophical Magazine.*

NEW INDELIBLE INK.

In a paper lately read before the Royal Society of Edinburgh, Dr. Traill, after an account of many unsuccessful experiments to produce a

durable ink from metallic combinations, stated that he had attempted the composition of a carbonaceous liquid, which should possess the qualities of good writing ink. The inks used by the ancients were carbonaceous, and have admirably resisted the effects of time; but the author has found that the specimens of writing on the Herculaneum and Egyptian *papyri* were effaced by washing with water; and, on forming inks after the descriptions of Vitruvius, Discorides, and Pliny, he found that they did not flow freely from the pen, and did not resist water,—qualities essential to a good writing ink in modern practice. The carbonaceous inks with resinous vehicles, rendered fluid by essential oils, though they resisted water and chemical agents, had the disadvantages of not flowing freely from the pen, and of spreading on the paper, so as to produce unseemly lines. Solutions of caoutchouc in coal-naptha, and a fragrant essential oil, lately imported from South America, under the name of *aceite de Sassafras* (the natural produce of a supposed *laurus*), were subject to the same objections.

Dr. Traill tried various animal and vegetable fluids as vehicles of the carbon, without obtaining the desired result, until he found in *a solution of the gluten of wheat in pyroligneous acid*, a fluid capable of readily uniting with carbon into an ink, possessing the qualities of a good, durable, writing ink. To prepare this ink, he directs gluten of wheat to be separated from the starch as completely as possible, by the usual process, and when recent to be dissolved in pyroligneous acid with the aid of heat. This forms a saponaceous fluid, which is to be tempered with water until the acid has the usual strength of vinegar. He grinds each ounce of this fluid with from eight to ten grains of the best lamp-black, and one grain and a half of indigo.

The following are the qualities of this ink:—1. It is formed of cheap materials. 2. It is easily made, the colouring matter readily incorporating with the vehicle. 3. Its colour is good. 4. It flows freely from the pen. 5. It dries quickly. 6. When dry it is not removeable from friction. 7. It is not affected by soaking in water. 8. Slips of paper written on by this ink have remained immersed in solutions of chemical agents, capable of immediately effacing or impairing common ink, for seventy-two hours, without change, unless the solutions be so concentrated as to injure the texture of the paper.—*Jameson's Journal.*

NEW COMPOUND OF SULPHATE OF LIME AND WATER.

PROFESSOR JOHNSTON has described to the British Association, a compound of sulphate of lime, deposited from a high-pressure boiler, containing half an atom of water. The compound was in the form of a powder, and its composition was considered interesting, inasmuch as it contained a different quantity of water to any other composition of the kind. The compounds of sulphates were better understood than any other, owing to their cheapness (sulphuric acid, for instance) and frequent use, but chemistry was not yet in possession of a tenth of the facts relating to even these. They were all aware that rock salt was procured in large quantities, and sulphate of lime was invariably found with it; hence Berzelius threw out the suggestion that rock salt had been subjected to great heat after it had been deposited in the earth. He (Mr. Johnston) did not, however, think that this conclusion could be positively drawn from the facts before them, inasmuch as nature had means of forming substances, to a knowledge of which man had not, and perhaps never would attain.—*Athenæum.*

NEW COMPOUND OF SULPHATE OF MAGNESIA AND WATER.

M. Fritche states that when a concentrated solution of sulphate of magnesia is exposed to the temperature of freezing water, there soon forms, in the midst of small lamellar crystals of ice, a salt white as enamel. When large masses of this solution are allowed to cool during the winter, the salt often separates in crystals of a finger's length; and by gently thawing the liquid, they may be separated, for they undergo no change in water at 32°.

The enamel-white appearance of these crystals arises from their consisting of a great number of still smaller crystals; the distinct crystals obtained by this process on the large scale have not the enamel tint, but are limpid and transparent. When subjected to a temperature above 32°, this compound soon begins to decompose; water separates; the crystals become opaque, and common sulphate is obtained with seven atoms of water. The new crystals retain their form, but the interior contains small crystals of the common sulphate. These crystals could not be dried even between folds of blotting paper without losing some water, and becoming slightly opaque at the surface: submitted to analysis the crystals were found to consist very nearly of:—

One eq. of sulphate of magnesia...............	60	= 35.77
Twelve eqs. of water	108	= 64.23
	168	100.

L'Institut; Philosophical Magazine.

ACTION OF SULPHATE OF AMMONIA UPON GLASS.

A mixture of muriate and nitrate of ammonia strongly corrodes glass, particularly glass containing lead. Sulphate of ammonia has precisely a similar action. As this salt, upon being heated, parts with a portion of its base, it may be considered as a salt with an excess of acid. When heated in a glass vessel to the temperature of 316° Fahr., it begins to melt; up to 600° Fahr. it does not suffer any changes; at this temperature, ammonia is driven off, sulphate and sulphite of ammonia sublime, and the glass vessel is much corroded. The whole inner surface of the glass becomes dim, while the sulphuric acid combines with the potash; and probably, the ammonia, as it is driven off, combines with the silicic acid. The glass generally flies to pieces, and in the centre is much acted upon; the fragments are fused with difficulty, and are recognised by the blowpipe as sulphate of potash.

M. R. F. Manhaud, who communicates these observations to Poggendorf's *Annals,* has often remarked that the watch-glasses (containing lead,) which he is in the habit of using, to dry substances in *vacuo* over sulphuric acid, after from two to four weeks become covered with numerous flaws, and small splinters may be easily separated from them. M. Manhaud has not been able to detect any loss of weight, wherefore the appearance cannot be due to any abstraction of the air contained in the glass, as Bischof, who observed something similar, surmises.—*Philosophical Magazine.*

SYNAPTASIN.

M. Robiquet has given the name of *synaptase* to the principle of almonds, which possesses the singular property of reacting on amygdalin, and of determining, under the influence of moisture, the production of the oil of bitter almonds. The name of synaptasin is derived from the power of

reuniting, as a connecting link, amygdalin and water. This substance possesses the following properties: it is of a yellowish white colour, sometimes brittle, and possessing the appearance of a varnish-like dried gluten; at other times it is opaque and spongy, like saracol. It is very soluble in cold water, but nearly insoluble in alcohol; when heated to about 140° Fahr. it is coagulated, when in solution in water; it is not precipitated either by acids or by acetate of lead, but readily by tannin; it does not, like diastase, form a paste when heated in water to 140° Fahr.; upon amygdalin it acts strongly, even at 176° Fahr.; when the solution is heated in contact with the air, it readily suffers a very evident decomposition, it becomes every day more turbid, acquires a fetid smell, and after a time a very abundant flocky precipitate is formed; when subjected to the action of heat, it tumefies, yields empyreumatic oil, and an acid which contains a little ammonia. This acidity induced M. Robiquet to suppose that it retained a little of the acetic acid used in preparing it: when, however, it is put in contact with concentrated sulphuric acid, it undergoes a kind of softening, but neither acetic nor sulphureous acid is disengaged; when a drop of tincture of iodine is added to a solution of synaptasin, a deep rose-red colour is produced, but without any precipitation.

Synaptasin is obtained by the following process: almonds, which have been deprived of their oil by pressure, are to be mixed with twice their weight of pure water, and the mixture is to be gradually pressed. After two hours maceration, the liquid is to be filtered, the albumen is precipitated by acetic acid, and after filtration the gum is to be separated by means of acetate of lead, and after again filtering, the excess of acetate of lead is to be separated quickly by hydrosulphuric acid, and the excess of hydrosulphuric acid is to be got rid of by the air-pump; the sulphuret is to be separated by the filter, and the synaptasin is to be precipitated by a sufficient quantity of alcohol. The sugar remains in solution, and the synaptasin, after washing with alcohol, is to be dried in *vacuo.—Journal de Chimie Medicale; Philosophical Magazine.*

ACTION OF LIGHT UPON SOLUTION OF POTASH.

Mr. Robert Mallet has explained to the British Association, a new case of Chemical Action of Light, in the decolouration of recent solutions of Caustic Potass of commerce.

The periods of complete decolouration under the following coloured shades, were as the numbers annexed to them:—

Violet Glass, exposed to air	30	hours.
Ditto closed	50	—
Transparent Flint Glass, exposed to air	80	—
Flint, closed	115	—
Yellow	170	—
Blue	185	—
Orange	190	—
Red	200	—

Means were taken to insure an equality of temperature in all the bottles. The solution, in Bristol "bright metal" bottles, was found unchanged in colour in 200 hours, agreeing with Mrs. Somerville's observation of the power of this green glass to resist the blackening of chloride of silver. The effect here, as this lady also observed, of the violet ray, in promoting chemical change, is remarkable. This appears to be the first attempt made to establish, in a form susceptible of being applied to numbers, the varying chemical effects of the different parts of the spectrum. The effects of differing temperatures in all the

bottles exposed was guarded against by coverings of ink of variable thickness, which Sir John Herschel had found transmitted white light undecomposed. The green colour of soapers' lees was explained by the foregoing, and the small number of observed cases of the chemical action of light (in so many of which chloride played a part), pointed out, with the importance of further and more careful investigations of this branch of Chemico-Physics.—*Athenæum.*

ANALYSIS OF THE BILE.

M. Demarcay has lately made some important researches on the bile; from which it appears that the bile is a kind of soap, consisting of choleate of soda. By the action of acids upon the choleic acid, two substances are formed, taurine and choloidic acid; and by the action of alkalis, ammonia and cholic acid result. The taurine contains the elements of two atoms oxalic acid, one atom ammonia, and four atoms water. It crystalizes in large, colourless, and transparent prisms. Choloidic acid resembles the fatty acids. *(L'Institut.)* Choleic acid separates in the form of an oily fluid, when the bile is treated with dilute muriatic, sulphuric, or phosphoric acid. Picromel is merely a mixture of bile and acetate of soda; the bile may be completely decomposed into sulphate of soda and salt of copper, by means of sulphate of copper, from which the organic acid may be separated by means of sulphuretted hydrogen. —*Thomson's British Annual.*

ACTION OF NITRIC ACID UPON ALCOHOL.

Dr. Golding Bird has detailed to the British Association certain experiments with the view of directing attention to one or two substances produced during the action of nitric acid upon alcohol, which he believed to have been hitherto overlooked. The following are some of the author's inferences: 1. During the action of nitric acid on alcohol, no oxalic acid is formed as long as nitrous ether alone distils over. 2. That aldehyd is not produced, at least in any appreciable quantity, until oxalic acid appears in the retort, and the production of nitrous ether entirely ceases. 3. That during the preparation of nitrous ether *in the cold,* acetic acid is abundantly produced, and appears to replace the oxalhydric acid formed when heat is employed. Dr. Bird also noticed, that in crystalizing the residual fluid in the retort, the first crop of oxalic acid crystals that appeared were of their ordinary form; but that those produced by subsequent evaporation were in pearly scales, much resembling in form the double cyanides, which had been previously exhibited by W. West.—*Athenæum.*

VEGETABLE ACIDS.

It is very probable that the acid of turnips, cucumbers, &c., is simply acetic acid. Many other plants exist in which particular acids have been discovered, the composition of which is unknown; but it may be affirmed, with much probability, that, if all those acids were carefully examined, they would be reduced to a very small number. M. Liebig, in his *Annal der Pharm.* for November 1837, recommends naturalists to examine this subject; reminding them that the acid of fruits changes after their arrival at maturity: that, for example, the fruit of the mountain-ash contains, during the first months, tartaric acid; later, tartaric and citric acid; and, finally, malic acid only.—*Bibliothèque Universelle de Genève:*

MANUFACTURE OF SULPHURIC ACID.

Mr. H. Watson, of the Manchester Philosophical Society, has instituted a series of experiments to ascertain whether the evaporation of water from dilute sulphuric acid can be carried on to the same extent in air as in vacuo, and has found that the evaporating force of air upon such acid is less than that of a vacuum at the same temperature. Hence he concludes that the evaportion of water is not attributable to a chemical affinity between the vapour of the liquid and atmospheric air; but thinks that indicates the obstruction to this process in the open atmosphere to be rather owing to the pressure than to the *vis inertiæ* of the particles of air. He also thinks that improvements will result from this inquiry with regard to the economical management of the process of manufacturing sulphuric acid, which would be greatly expedited by the regulated admission of steam into the condensing chambers kept at a constant high temperature.—*Proc. Royal Soc.; Philos. Magazine.*

BALSAMS.

M. Freney has been searching into the chemical properties of various balsams, especially that of Peru, which presents the greatest analogy to greasy substances: it contains a matter perfectly resembling oleine, and which saponifies with alkalies. A crystaline matter is also deposited by it, which is transformed into cinnamate of potash and hydrogen gas, when heated with melted hydrate of potash. The liquid matter of the Peruvian balsam is that which is transformed into resin, and the crystaline gives cinnamic acid: neither this balsam, nor that of Tolu, afford benzoic acid, as hitherto supposed.—*Athenæum*

PROPORTIONS OF GLUTEN IN GRAIN.

M. Boussingault has made some researches on the proportions of gluten contained in the flour of different kinds of grain cultivated in the same soil. He determined the quantity of gluten by ascertaining that of ammonia which each yielded; this plan being attended by more precise results than that of working the flour between the fingers under a stream of water. The flour from corn grown in the Jardin des Plantes yielded gluten in the proportions of one to fifteen; the differences dependant upon the influences of the soil and that of the climate are much more strongly marked, and amount to from one to four.—*Journ. de Chimie Med.; Philosophical Magazine.*

TRANSPARENCY OF CARBON.

Degen has attempted to prove that charcoal in very thin layers possesses a very considerable degree of transparency, and appears of a yellowish-brown colour. To demonstrate this he placed a piece of pure charcoal on burning coals in a small furnace, so close that very little air could enter it, so that the piece of charcoal should undergo combustion in an atmosphere loaded with carbonic acid: under these circumstances the more porous portion burns, whilst the denser portion, consisting of an aggregation of small vessels is left: the walls of these carefully examined under a microscope, appear translucent.

If a piece of glass covered with lac-varnish and sprinkled with charcoal powder is ignited in a crucible, so as to carbonize the varnish, the thin layer (of carbon?) left is transparent and yellowish-brown.—*Poggendorf's Annals; Philosphical Magazine.*

MELTING SNOW WITH SALT.

PEOPLE are in the habit of sprinkling salt upon snow before their doors. They could not do a more silly or injurious thing. The result is to change dry snow or ice at the temperature of 32 to brine at 0. The injurious effect of damp upon the feet at this excessive degree of cold is likely to be extreme. If, then, any one does sprinkle salt upon snow in the street, he ought to feel it a matter of conscience to sweep it away immediately.—*Faraday.*

PRUSSIC ACID COUNTERACTED.

DR. JOHN ROBINSON, of Sunderland, has proved, by public experiment, that the poison of prussic acid is not so certainly fatal as has been believed. Having apparently killed two rabbits by four drops each of strong hydrocyanic acid, he revived them by pouring very cold water from a height over the occiput and spine.—*Sunderland Newspaper.*

POTATO BRANDY.

SEVERAL physicians have already pointed out the deleterious effects of Potato Brandy: but as the researches of chemists could not find any injurious principle in the rectified spirit, no attention was paid to this opinion. M. Krauss, of Dusseldorf, imagines that he has found out the difference between spirit of wine and spirit of potatoes, but he deems it much more important first to shew that not only is the rectification of the latter spirit too often carelessly conducted, but the spirit itself is made from potatoes which are either rotten, or which have begun to germinate. Its effects upon the human frame he describes as dreadful; producing delirium tremens, idiocy, &c.—*Abridged from the Mechanics' Magazine.*

ANALYSIS OF THE BUXTON WATERS.

THESE waters have been analysed by Mr. Garden, under the superintendence of Sir Charles Scudamore, and the following was the result obtained from one gallon:—

Of gaseous contents.	Cubic inches.
Carbonic acid	1.50
Nitrogen	4.64
	6.14
Of solid contents.	Grains.
Muriate of magnesia	.58
,, soda	2.40
Sulphate of lime	.60
Carbonate of lime	10.40
Extractive matter, and a minute quantity of vegetable fibres	.50
Loss	.52
	15.00

It thus appears that these waters contain fifteen grains of solid matter, and six cubic inches of gas, in the gallon.—*Literary Gazette.*

NEW METHOD OF EXTRACTING IODINE FROM KELP.

M. LASSAIGNE proposes to treat a certain quantity of iodine with repeated portions of water, mixing the solutions, saturating with weak nitric acid, and adding nitrate or chloride of palladium, when the liquor becomes immediately brown by the iodide of palladium formed. This reagent is capable of detecting quantities of iodine which are not shewn by starch, chloride of platina, or nitrate of silver: it is important, on account of its numerous applications in medicine and the arts.

HARPER AND JOYCE'S PATENT STOVE.

Few inventions or discoveries in the arts of life have so promptly and generally attracted public attention as the above stove, exhibited in the early part of the year, at the Jerusalem Coffee-house, Cornhill. It is of an upright cylindrical form, of bronze, with an ornamental top and tripod stand; a band encircles the middle, to which two handles are attached. The whole is very much in the form of an old fashioned upright coffee-urn. A small pipe admits air from the bottom, which passes through the fuel, and escapes by a valve at the top; this valve can be so regulated by raising or depressing it, as to create any degree of heat; but the heat generally required is about 400°, radiating from the sides, to which, on applying a piece of paper, it will be scorched, but not ignited. This apparatus, the inventor stated, he had constantly used in his bed room, without experiencing the slightest inconvenience, or any ill effects from the combustion of the fuel, which, he stated, did not contain any deleterious qualities: the invention was the result of fourteen years' continued experiment, and he had only been prevented heretofore from obtaining a patent for want of pecuniary aid. The economy of the invention was stated to equal its high convenience; a stove of this kind, six inches in diameter, and eighteen inches high, evolving sufficient heat to maintain a room twenty-five feet square and twelve feet high, at a comfortable temperature in winter. It would not require to be fed with fuel more than once a day, and the daily expense would not exceed fourpence. The air which had passed through the fire place was permitted to escape through the regulator into the apartment, so that there was neither flue nor chimney. The stove was, consequently, moveable, and being small in bulk and light in weight, might be transferred from room to room without difficulty.

One of the stoves, with a nine inch exterior and seven inch interior cylinder, gives out a heat at a temperature of 60° for twenty-four hours. The degree of heat may be regulated at pleasure, and by shutting down the regulator, the same quantity of fuel would be made to last forty-eight hours. Many were the conjectures upon the nature of the fuel used, and many experiments were made by practical men to obtain similar results. Among the materials experimented upon were coal, coke, charcoal, ashes, and turf, with admixtures of lime, salt, saltpetre, and vitriolic acid, in various proportions, and mixed in a variety of ways; and many valuable results were the consequence.

The "excitement" produced by this popular invention having soon extended to the Continent, it was referred by the French Academy of Sciences to M. Gay-Lussac for examination, who reported thereon as follows:—

The fuel employed is a very light charcoal, impregnated, it is said, with carbonate of soda, to retain the carbonic acid produced in burning. I have found an authentic specimen of this fuel to contain, carbonate, not of soda, but of potash, yet in so minute a quantity, that I am certain it does not amount to one-four-thousandth of the weight of the charcoal; hence it burns with as much facility as the charcoals of other light woods.

It is therefore quite evident, that this charcoal must *diffuse in the apartment as much carbonic acid during its combustion, as an equal weight of any other charcoal;* that it must *vitiate the air in the same degree*, and that *the same accidents may be produced by it as in other cases;* it is equally evident, that it can produce *no more heat* than the same quantity of common charcoal, as it contains no more combustible matter.

M. Gay-Lussac concludes:

1st—That the fuel is merely a light charcoal, well prepared, but containing no alkali besides that which it naturally possesses.

2nd—That this fuel gives no more heat than the ordinary charcoal of wood.

3rd—That the mode in which the combustion is conducted, diffusing its whole products, and thereby vitiating the air of the apartment in which the stove is placed, is the only real source of economy beyond other processes.

4th—That a constructed stove, ventilated by air brought from the exterior, may be made to give out nine-tenths of the heat produced by the combustion of the fuel, without vitiating the air of the apartment, or giving out any unpleasant smell; and that its use would be safer than the new process, and nearly as economical!

The Royal Society of Edinburgh next fully confirmed the opinion of the Parisian chemists. At the meeting of the Society, on Easter Monday, one of the stoves was exhibited in action, and, by way of proof positive of its deleterious effects, Sir John Robison, one of the secretaries, held a lighted match above it, which was speedily *extinguished*, by the invisible but noxious vapour rising from the dome. Meanwhile, Professor Everitt delivered a luminous exposition of the subject, to the Westminster Medical Society; and deduced the following conclusions:—

1st—The fuel, called "prepared fuel," used in these boxes, differs from common charcoal in its being perfectly charred, or having no portion of wood left half-decomposed; that it differs in no essential from well-burnt wood charcoal.

2nd—That all the air which passes through these boxes, when fairly in combustion, is entirely deprived of its oxygen, this being replaced by a bulk of carbonic acid gas.

3rd—That a stove, or box, nineteen inches high, and six and three-quarters diameter, consumes about 40,253 grains (five and seven-tenths of a pound) of pure carbon in twenty-four hours, and generates one hundred and eighty and eight-tenths cubit feet of carbonic acid gas in that time.

4th—That this is as much, hour by hour, as is produced by eight adults by respiration.

5th—That what is implied by the following quotation from the printed circulars of the patentee—"To guard against accidents from the neglect or mistake of servants using *common charcoal*, a pipe will be attached to the apparatus for bed-rooms," viz. that if *their prepared fuel* be used no deleterious gas or vapour is produced, is incorrect.

6th—That if only a part of what is recorded relative to the noxious action of carbonic acid gas on animals be true (See Christieson, pp. 744 to 754), then in no case ought these boxes to be used for heating dwelling rooms, unless provision be made for carrying off the products of combustion.

7th—That by the combustion of any given weight of charcoal, the same quantity of heat is generated as by the combustion of the same weight of prepared fuel.

8th—That having the means to regulate the entrance of air to keep up combustion into a furnace where charcoal is burning, will effect the same end as having the means of regulating the exit after combustion.

Mr. Everitt, in conclusion, stated that as soon as Mr. Harper had become acquainted with the positive results arrived at by this investigation, he determined to attach to the stoves contrivances for carrying out of the apartment all the products of combustion; but, by this addition the main feature of the invention will be lost.

The fall of this novelty in public estimation has been as signal as its start. Besides the expositions already quoted, an experiment with one of these stoves has been attended with loss of life. The churchwardens of St. Michael's, Cornhill, having placed the stove in an aisle for warming

the church, previous to the service of the next day, on opening the doors next morning, the church was found full of vapour, and the person who had been appointed to watch the stove lying near it, dead. At the inquest held upon the body, the evidence of Dr. Golding Bird, and Messrs. Cooper and Brand was adduced to prove that the vapour of the stove had not produced the fatal effect. An experiment was then made upon the atmosphere of the church after a stove had been burning in it ten hours, the doors being closed. Dr. Golding Bird stated, that the carbonic acid gas which was emitted by the stove in St. Michael's church at the time of the deceased's death could not have been sufficient to prejudice life. The specimen of atmospheric air that himself and Messrs. Cooper and Brande had collected that day was from three aisles and the organ gallery, and did not contain more than one-and-a-half per cent., which certainly could not have occasioned death. Mr. J. T. Cooper, Professor of Chemistry, deposed that he had made several experiments with the stoves, and was convinced from them, that if the stove was properly adjusted to the size of the apartment there was no danger to be apprehended. The quantity of carbonic gas contained in the stove at full heat never exceeded quite one per cent. St. Michael's church contains about 100,000 cubit feet. The quantity of charcoal which the stove contained at the time of lighting on the Saturday night was forty-nine pounds. If it was possible that such could be consumed in a moment, it would not reach one-and-a-half per cent. Ten per cent. of carbonic gas would be sufficient to throw a person into an insensible state; twelve per cent. of the gas would, in his opinion, be enough to destroy life. Mr. Brande, who also went into the church on the doors being opened, corroborated the above testimony. The jury, however, returned a verdict—"that the deceased came to his death by apoplexy, accelerated by inhaling impure air."

A method of preparing charcoal will be found at page 78 of the present volume. The idea is, by no means, new; for, in the *London Magazine* for December, 1758, is the following paragraph: Tuesday, November 26:—" Some persons having been almost suffocated lately by sleeping in a room wherein was a charcoal fire, it has been declared that experiment has proved, that charcoal fire wetted with salt dissolved in water will have no suffocating quality."—*Abridged from Civil Eng. and Arch. Journ.; Mechanics' Mag.; Athenæum.*

WATER OF LONDON.

In a late report made by Professor Brande to the Commissioners of Woods and Forests, on the state of the spring water in the wells of London, many of them are represented as contaminated by oozings and leakages from the adjacent gas-pipes to such an extent as to render the water quite unfit for use. This, however, is not the only source of contamination; for Mr. Brande states, in his *Manual of Chemistry*, that the springs of London not unfrequently contain various impurities of organic origin, sometimes in very sensible quantities. These are derived from neighbouring sewers, and very frequently from churchyards, such being the situation, as Mr. Brande observes, generally chosen for the parish pump. This disgusting source of water should, at all events be avoided, and the disgraceful system of burying the dead in the streets of London should be authoritatively discontinued. It is not only repulsive, but dangerous as a source of infection. The casual observer is not aware of the extent of this evil, and of the extraordinary heaps of

bodies which, in many of the London churchyards, lie just beneath the surface. St. Clement's in the Strand, is a fair average specimen; but there are many infinitely worse; and, all those churchyards which are raised considerably above the streets, such as St. Bride's, St. Andrew's, St. James's, Barking churchyard, and hundreds of others, are entire formations, as a geologist would say, of bones, bodies, and coffins, in different states of decomposition.—*Times.*

BLOWPIPE MOUTH FOR OXYGEN AND HYDROGEN.

In the late edition of Dr. Turner's *Chemistry*, much credit is given to Professor Daniell, of London, for the invention of a new jet to the compound blowpipe, which is calculated greatly to increase the safety of that apparatus. Professor Daniell has also engraved and described the same in the *Philosophical Magazine*, vol. ii, p. 57, 3rd series. This jet was contrived by Professor Webster, of Cambridge, Mass., in 1824, who sent a drawing and model of it to Mr. Newman, the well-known maker of philosophical instruments, in London, by whom a jet was made and sent over, which Dr. W. has continued to use in his lectures, and on all occasions, ever since, with perfect safety. A jet on the same principle, was previously devised by Dr. W., and figured in his *Manual of Chemistry*, edit. 1 and 2. This was wholly of brass, and made by Dwelle, of Boston; an improvement being made by introducing one of the gases into the end of the central tube, instead of the side.—*Silliman's Journal.*

EXPERIMENTS ON SEA-WATER.

Samples of sea-water collected during the recent voyage of the *Bonité*, by means of M. Biot's apparatus, have been examined by M. Darondeau. Amongst the more important results are one or other of these equally remarkable facts, to be confirmed only by analysis on the spot: 1. That sea-water, at a certain depth, holds in solution a much greater quantity of carbonic acid than does water taken at the surface; or, 2. That at a certain depth the water contains many transparent animalculæ; or, at least, some organic matter which does not exist at the surface, and which decomposes with time, and takes from the air, which is held in solution in the water, its oxygen, so forming carbonic acid.—*Jameson's Journal.*

PROPAGATION OF HEAT IN LIQUIDS.

It was for a long time believed, on the authority of Romford, that liquids were non-conductors of heat, provided their particles were stationary. Nicholson, Pictet, and Murrai, shewed the error of Romford by some very conclusive experiments; but still the law of the propagation remained a secret. M. Despretz, however, has recently undertaken some experiments on this subject, and has not merely confirmed the latter philosophers, but has shewn that the law of the propagation of heat in quiescent fluids is precisely that of the propagation of heat in metallic bars.—*Railway Magazine.*

Natural History.

ZOOLOGY.

RESEARCHES IN EMBYOLOGY.

Dr. Martin Barry has presented the Royal Society the First Series of his Researches, which he divides into two parts. In the first part, the author describes the origin and structure of the ovisac, a vesicle common to all vertebrated animals, but hitherto regarded as the inner membrane of the "folliculus Graafianus" in Mammalia, and by some authors denominated the "Chorion," in others Vertebrata. He also describes the real nature of the "folliculus Graafianus," and its relation to the calyx of the bird; the germinal vesicle and its contents, as being the most primitive portion of the ovum; the order of formation of several of the other parts of the ovarian ovum; and the true chorion of Mammalia as being a structure superadded within the ovary.

In the second part is described a granulous tunic of the ovum of Mammalia not hitherto observed; the manner of origin of the "membrana granulosa" of authors; the different situations of the ovum in the Graafian vesicle at certain periods *antecoitum*, not hitherto observed; and certain structures, by means of which the ovum is made to occupy the several situations.—*Proceedings of the Royal Society.*

TEMPERATURE OF THE HUMAN BODY.

By a series of experiments continued daily, except in rough weather, and a few other occasions, from April, 1836, to November 6, 1837, on ten men of *La Bonité*, during her voyage round the world, it appears that the heat of the human body rises or falls with like changes in the external atmosphere. It sinks slowly in passing from a hot to a cold clime; it rises more rapidly in the contrary passage; but it is more marked in some individuals than in others. The same men, however, shewed only a single degree of centigrade (one and four-fifths Fahrenheit) difference under a change of 40° of external temperature; that is, at Cape Horn, when the temperature was 0° cent., and in the Ganges, near Calcutta, where the air was 40° cent.

Experiments lately made by M.M. Becquerel, Breschet, &c. on the temperature of the organic tissues of the human body, by means of thermo-electric effects, have shewn, among other results, that when the human body was in contact for twenty minutes with water, the temperature of which varied from 0° to 498, the temperature of the muscles underwent

very slight changes. It was thought dangerous to prolong the immersion, as the heat of 49° had greatly reddened the skin, and driven the blood to the head.—*Literary Gazette.*

The best mode of ascertaining this temperature is to place one of the needles in the mouth; taking care that the person so treated should have been previously trained to breathe through the nostrils. On comparing this needle with others placed in the different muscles of the body, it has proved, that the temperature of the mouth is far more constant than that of other parts of the human frame.—*Athenæum.*

CRITERION OF DEATH.

It is known that physiologists have not hitherto agreed as to any certain test by which the event of death is rendered certain; or, in other words, no recognised distinction exists between the human body immediately before and immediately after death. A correspondent of the French Academy has intimated that he has found that the blood taken from the body after death is distinguished from the blood before death by its being non-coagulable.—*Monthly Chronicle.*

MICROSCOPIC EXAMINATION OF BLOOD.

M. Donne has informed the French Academy that he has observed three kinds of particles in blood, sanguineous particles properly so called, red, circular, flattened, and with an obscure point in their centre: small globules, attributed to chyle; and white globules, spherical, a little rough, somewhat larger than the red, and without any spot in the centre. These last are much more numerous than they have been supposed; they are spherical or elliptic, in greater or less number, according to circumstances and the health of the animals. M. Donné concludes that the alterations which the blood undergoes in the sick, do not depend on the difference in the proportion of the elements only. The globules are also the seat of organic modifications, which microscopic observations alone can discover.—*Railway Magazine.*

STRUCTURE OF TEETH.

Professor Owen has read to the British Association an elaborate paper, "On the Structure of Teeth, and the Resemblance of Ivory to Bone, as illustrated by Microscopical Examination of the Teeth of Man, and of various existing and extinct Animals." The recent investigations on the intimate structure of the teeth, particularly those of Purkinje, Müller, and Retzius, were very fully detailed and discussed. Until very lately, the analogy of tooth to bone was supposed to extend only to the chemical compound in the hardening material; and the arrangement and deposition of this matter was thought to differ from that of bone, and to correspond with the mode of the growth of hair, which, in their general vital properties, teeth much resemble. Their apparent laminated structure, observed during the progresss of decomposition, the supposed proof, was equally applicable to bone; and the appearances presented by the superficies of vertical sections of teeth were due, not to the interval of separate and superimposed laminæ, but to the diffraction of light caused by the undulation of a series of parallel tubes proceeding in a contrary direction to the supposed laminæ. This apparent structure is not, however, constant nor equally plain in different teeth. We need not follow the learned Professor through his notices on the experiments of Müller on the dental tubuli, nor through his analysis of the micro-

scopical observations of Retzius, with reference to the intricate arrangement of the tubes and cells. And our space will not allow us to describe his illustration of the analogy subsisting between tooth and bone by his own highly interesting and numerous observations on the structure of recent and fossil teeth.—*Literary Gazette.*

With reference to the application of the tubular structure of the teeth to the explanation of their pathology, nothing has hitherto been attempted. Professor Owen observed, that it was a new and fertile field, which might suggest some good practical improvements in dental surgery. Ordinary decay of the teeth commenced, in the majority of instances, immediately beneath the enamel, in the fine ramifications of the peripheral extremities of the tubes, and proceeded in the direction of the main tubes, and, consequently, by the most direct route to the cavity of the pulp. The decayed substance, in some instances, retains the characteristic tubular structure, which is also observable in the animal basis of healthy teeth after the artificial removal of the earthy salts. The soft condition of the decayed portion of a tooth is well known to all dentists; it depends upon the removal of the earthy salts from the containing tubes and cells, in which process the decay of teeth essentially consists. The main object of the dentist seems, therefore, to be, to detect those appearances in the enamel which indicate the commencement of decay; to break away the enamel, whose natural adhesion to the ivory will be found more or less dissolved at the decayed part; to remove the softened portion of the ivory, and fill up the cavity with gold or other substance. Experience proves, what theory cannot account for,—viz. that the progress of the decay is sometimes thus permanently arrested. The calcareous salts are in such cases, as it were, poured out from the extremities of the tubes divided in the operation, and a thin dense layer intervenes between the exposed surface of the ivory and the stopping.—*Athenæum.*

EXTRAORDINARY BIRTH.

The truth of the following account of an extraordinary phenomenon is warranted by a letter from Rambouillet, quoted by the *Journal des Debats*: "On the 7th October, a woman of the commune of Prunay-sous-Ablis was brought to bed of twin daughters, but so united as to have the appearance of one body with two heads, four legs, and four arms. Two vertebral columns are perfectly distinguishable, and there are two chests and throats, with the organs of deglutition. There are also distinct organs of evacuation for each, and consequently, it is inferred that the whole of the internal economy is double; but there was only one umbilical cord. It is clear that the faculties of the two united beings are distinct, as one is frequently engaged in taking nourishment while the other is asleep. The heads are reversed, so that should one be placed on its feet, the head of the other would be hanging downwards, with the feet in the air. The length of the two children is twenty inches. The arterial pulsations are isochronic in general, but those of one are a little more frequent than in the other."

INHABITANTS OF SOUTH AMERICA.

Man in South America has formed the especial study of M. Alcide d'Orbigny, who classes him into three distinct races: 1. The Ando-Peruvian. 2. The Pampean. 3. The Brazilio-Guaranian. The first is subdivided into three branches; the Peruvians, the Antisians, and the

Araucanians, who have preserved their original characters, being to this day warlike, reflective, proud, and cold. The Pampean race is divided by M. d'Orbigny into the Pampeans proper, the Chiquitean, and the Moxean; the first including the Patagonians, with their broad flat noses and ferocious dispositions. Of the third race there is but one branch, consisting of only two nations, the Guarani and Botocudo, each remarkable for oblique eyes.—*Athenæum.*

ARABS.

BARON LARREY has read a memoir at the French Academy of Sciences, which sets forth his observations on the Arabs; observations which have led him to conclude, that they spring from the primitive race of the earth. He states, that their physical frame is more perfect in every respect than that of other men, and even their peculiarities tend to give them strength and agility. The circumvolutions of the brain are more numerous, and the substance of this organ denser and firmer than that of other races. The nervous system is also more dense than that of Europeans; the heart and vascular system present the greatest regularity, and the most perfect development; their senses are exquisite. To these physical superiorities the Baron adds the gift of superior intellect, an observation scarcely borne out by their present condition.—*Athenæum.*

ROMAN SKELETONS.

SEVERAL Roman skeletons have recently been discovered on the line of the Great Western Railway in a high portion of ground contiguous to the Berkshire Downs, in reference to which the *Medical Gazette* contains the following interesting observations:—"The bone is still hard and compact, and has undergone but little alteration of structure. Some of the animal matter has disappeared, and its place has been supplied by the carbonate of lime from the nidus in which it reposed, and effervesces strongly when acted upon by the mineral acids. The surface had a reticulated appearance, owing to the partial denudation of the external surface by ossiphagous insects. The bones of the head and face are of dimensions exceedingly contracted, at least in comparison with those of a well-formed adult of the present day. The *ossa nasi* of the skulls possess most extraordinary incurvations, which must have had the effect of subjecting the wearers, though Romans, to particularly 'pug' noses; and we are all aware of the characters assigned by popular consent to nasal organs of this peculiar conformation. The great departure from the regular structure, however, remains to be noticed. The existing teeth of the upper jaw (the only ones unfortunately preserved,) are eleven in number; five of the molares were lost during life, as the sockets or alveolar processes are consolidated by ossification. The crowns of the incisors stand prominently from the jaw, and are evidently not worn to any extent by attrition; but instead of presenting the usual wedge-shaped appearance, (having the posterior and anterior surface meeting at a sharp angle,) they are of an irregular solid oval form, strongly coated with enamel, and in every respect like the natural molares. The fangs are single, and of the usual long pyramidal form at their insertion in front of the maxillæ. The bicus fides have lost their identity, and partake of the same peculiarity; so that, in fact, the whole now presents the unusual appearance along the entire line of a set of sturdy and uniform molares. I look upon this as a purely accidental conformation, not

presuming that the inhabitants of the Eternal City so far departed from the universal system as to wear their molar teeth in the most conspicuous part of their maxillæ."

MALAYAN ALBINO.

MR. NEWBOLD states in the *Journal of the Asiatic Society*, of Bengal, that he has seen at Gressik an Albino Malayan lad. His skin was of a reddish white, with blotches, and thinly covered with short white hairs. The eyes were small and contracted; the iris of a very light vascular blue; the lids red, and fringed with short white lashes; the eyebrows scant and of the same colour; the pupil much contracted from the light; and he almost constantly kept his eyes shaded with his hands. He said he could see better than his neighbours in imperfect darkness, and best by moonlight. He was also morbidly sensible to heat. His grandfather was an Albino; his parents were of the usual colour; his sister is an Albino, like himself. Albinos, according to Mr. Newbold, are not common on the peninsula; nor are there any tribes of them, as according to Voltaire, existing in the midst of Africa. In the only two instances recollected by Mr. N. the eyes were of a very light blue; the cuticle roughish and of a rosy blush, very different from that of the two African Albinos seen and described by Voltaire, and quoted by Lawrence.—*Abd. from the Athenæum.*

ANIMALS OF THE NAMAQUA COUNTRY.

SIR J. E. ALEXANDER, in his Expedition into this hitherto unexplored portion of Southern Africa, states that all the large wild animals are to be found here; but elephants are now several days' journey east of the Fish River. Lions are every where found; most of which are of the usual light brown colour, whilst others are entirely black, with long hair; a third sort is white; a fourth has striped legs, like those of a tiger; and a fifth has a white neck. He saw the common lion and part of a white one. The two-horned rhinoceroses, both black and white, are now found in the upper parts of the Fish River; zebras are every where in the land; beautiful spotted panthers; plenty of giraffes, or camelopards, buffaloes, koodoes, gemboks, elands, hartibeests, klipspringers, springboks, and others of the deer tribe; hyænas, wild boars, jackals, pole-cats, rats, and mice, are in great abundance. The larger birds are ostriches, eagles, vultures, bustards, cranes, pheasants, and guinea-fowl. There is a great variety of small birds, particularly along the constant waters of the Fish River. Snakes and serpents are in plenty; fortunately there are very few musquitoes; "but there is a troublesome and small red-bodied tormentor, with eight legs, called the bush-louse."

ANIMALS OF SIERRA LEONE.

ON May 22, was read to the Zoological Society, a letter from Mr. Straughan, of Sierra Leone, stating that a proposed supply of new specimens to the Society had been retarded by the very unhealthy state of the colony. Before the rains, two very fine and young female chimpanzees had been obtained, which were on their way over to this country. He considered that it would be very easy to obtain hippopotami, but that the difficulty would be in transporting them to England in a timber ship, which had but small accommodation, and would be from ten to twelve weeks on the passage. The object might, however, be easily accomplished in a homeward-bound man-of-war. The writer also suggested that the future governors of Sierra Leone and the Gambia should be ex-officio

honorary members, on account of the opportunities which they possessed for forwarding the science of zoology.

MAMMALIA OF FERNANDO PO.

On May 18, Mr. Waterhouse exhibited before the Zoological Society, a valuable series of skins of mammalia, from the island of Fernando Po, which had been recently presented to the Society's Museum by George Knapp, Esq. The collection contained eight or nine species considered entirely new; including two undescribed species of the genus *Colobus*, forming a most important addition to that group of *Quadrumana*, of which our knowledge is extremely limited, from the very small number of skins hitherto brought to Europe. Mr. Waterhouse proposes to name one of these Colobi in honour of Pennant, *C. Pennantii*, it being nearest to the bay monkey of that naturalist yet discovered, but differing from it in having the throat and cheeks white, and in exhibiting three distinct shades of colouring on the body; Pennant's species was also from a different locality, Sierra Leone, a circumstance which strengthens the probability of its being distinct. For the remaining species of Colobus, Mr. Waterhouse proposes the specific appellation of *Satanas;* its uniform black colour will at once distinguish it from the only allied species, *leucoprymnus* and *ursinus*, the former having white thighs and a white throat, while the latter has the tail entirely white. Two species of the genus *cercopithecus* were next described and named, one *C. Martini*, and the other *C. erythrotis*. A new species of genet, stated to differ from all other African genets in its general colour, and the dark marks and spots on the body, was called *Genetta Poensis*. A new otter was named *Lutra Poensis;* and an antelope, also included in the same collection, was characterised as *Antilope Ogilbyi*.—*Mag. Nat. His.*

ZOOLOGY OF JAVA.

Temminck, in the *Fauna Japonica*, states, that he knows eighty-two kinds of mammalia, 455 birds, and ninety species of amphibia, as inhabiting that island, although the interior is almost entirely unknown.—*An. Nat. Hist.*

THE ASHMOLEAN MUSEUM.

Dr. Daubeny has presented to this collection such of the following zoological specimens as were not previously in it, the whole having been collected during his late tour on the American continent and the West India Islands. They consist of about sixty birds, including a very rare trogon, from the island of Cuba; a few mammalia, including an opossum, and several reptiles, amongst which were two species of the rattlesnake and five other American serpents, two sirens allied to the *Proteus Anguineus* of Carniola, a small alligator from Louisiana, and a curious horned Lizard from the Texas. Mr. Holme, of C.C.C., then observed that the specific name of the trogon was *Temnurus*, from the ends of the tail feathers appearing as if cut and spread out. The only other specimen in Europe is in the Museum at Paris, and has been figured in Temminck's *Planches Coloriées* under the above name. The specimen presented by Dr. Daubeny appeared to be either more adult than that at Paris, or in a more perfect state of plumage. The horned lizard from Texas is the animal erroneously described by travellers as a horned frog. The alligator is a small specimen of the species described by Mr. Waterton in his travels.—*Abridged from the Athenæum.*

THE ZOOLOGICAL SOCIETY.

THE Annual Report to May 1838, states, that the receipts of the Society for the past year were £15,425: 19*s*., including £200 in exchequer bills drawn from the funded property of the Society; the disbursements were charged at £15,170: 3*s*. 8*d*.; leaving a balance of £254: 18*s*. 1*d*. There had been a decrease of £3,800 in the receipts at the Garden gates, as compared with the preceding year; but this was attributed to the cold and inclement spring and late summer. In the amount of admission fees paid by new members, too, there was a decrease of £550. The auditors' report hinted at the inappropriate and ill-chosen locality of the premises selected for the exhibition of the Society's valuable collection.

The stock on May 31, was,—quadrupeds, 297; birds, 637; reptiles, 18; total, 952; being an increase on the month of twenty-one subjects.

The number of visitors to the "Gardens" during the above year, amounted to 173,778, of which there were: Fellows, 20,619; strangers accompanying them, 31,414; holders of ivory tickets, 4,620; strangers accompanying them, 4,160; and persons paying for admission, 112,965. The total sum received from this source was £5,648: 5*s*. The total receipts for the year 1838 have been £14,094 : 2*s*. : 9*d*.; expenditure, £12,588 : 12*s*.: 1*d*.; excess of income, £1,505 : 10*s*.: 8*d*. Although the collection of carnivora contained two lions, three tigers, and eight leopards, there has been no mortality amongst them during the year.—The quadrupeds bred in the gardens since the discontinuance of the Farm at Kingston, are the following: Dromedary, Burchell zebra, and cross-bred Burchell zebra, nine nylghaus, Exmore pony, and cross-bred Exmore pony, American fallow, common fallow, and native musk deer, four Axis deer, three Sambu deer, two Stanley musk deer, six Brahmin cattle, two small zebras, two Bengal goats, seven Ganges goats, two Canada goats, Cape sheep, two Moufflon sheep, two Abyssinian sheep, four Demerara sheep, two bush kangaroos, seven greater kangaroos, two peccaries, three wild boars, one porcupine, five armadilloes, three pumas, eight Persian cats, and one half-bred ditto, five Mogadore dogs, eleven Persian greyhounds, six Pyrenean dogs, eighteen Barbary dogs, five Indian dogs, twenty-one Australian dogs, three Scotch terrier dogs, twenty-three wolves, and four cross-bred foxes. The birds bred consist of twelve emeus, and of thirty-three varieties of foreign doves, aquatic and other fowl. The above list includes a period of nearly seven years, being from June 1, 1830, to December 31, 1837.—*Times*.

ROYAL ZOOLOGICAL GARDENS, SURREY.

THIS popular place of resort has been greatly improved during the past year, by the ornamenting of some of the buildings previously erected, the erection of one or two new ones, and some alterations in the disposition of the grounds. The new arrivals have comprised—an

Asiatic Rhinoceros, female (young), *Rhinoceros Unicornis*.

Bush Cow, Sierra Leone, *Bos Brachyceros*, Gray. (An unique specimen of a very curious and interesting animal, described by Mr. Gray, in *Annals of Natural History*, No. 10.)

Four Bisons, North America, *Bos Americanus*. (The first time so many have been seen together in England.)

Beaver, North America, *Castor Fiber*.

Otter, Ditto. *Lutra Canadensis*.

Three Tigers, male and female, (young), Saugur, *Felis Tigris.*
Two Jaguars, (young), *Felis Onca.*
Snowy Owl, Kamskatka, *Strix Nyctea.*
Three Long-eared Owls, Britain, *Strix Otus.*
Two King Vultures, South America, *Cathartes Papa,* Shaw.
Sociable Ditto, Ditto, *Vultur auricularis.*
Three Black Parrots, Madagascar, *Psittacus Niger,* Lath.
Three Red-cheeked Nymphicus, New Holland, *Nymphicus, Novæ Hollandæ.*
Three Rose-breasted Parrots, New Holland, *Psittacus Eos.* (Extremely scarce.)
A new Parrot from King George's Sound.
Among the additions by birth have been a young Wapiti (*Cervus Wapiti*), and Kangaroo, (*Macropus Major.*)

FOOD OF CARNIVORA IN MENAGERIES.

An experiment has been made by the Zoological Society, which promises materially to diminish the constant expense of the menagerie. It consists of the partial substitution of horse-flesh for beef, as the food of the carnivora. The horses slaughtered for this purpose are previously inspected by the medical superintendent, the change has been made cautiously, and the results were carefully watched. On June 25, a mare, in low condition, and without any inflammatory complaint, was killed at the Gardens, and the carcase, when cut up, appeared perfectly healthy. It was given to two tigers, four leopards, one lion, one puma, five hyænas, three eagles, two wolves, and five vultures: they all ate it just as readily as they used to devour their former meat, and not the slightest ill consequence has ensued.—*Literary Gazette.*

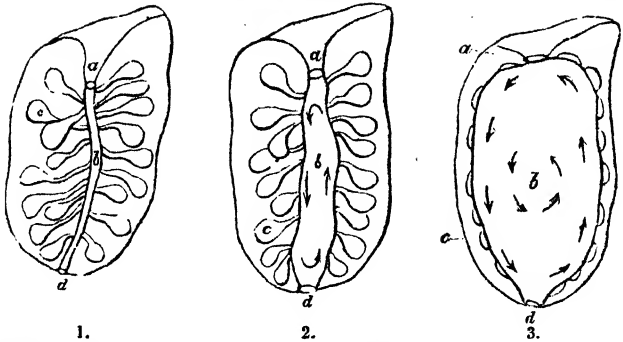
FOSSIL AND RECENT INFUSORIA.

Professor Ehrenberg having occupied himself with the investigation of microscopic organized beings, not only in Europe but also upon numerous voyages for several years in other quarters of the globe, has lately completed his large work, which consists of a thick folio volume of text and sixty plates; and in which the Professor has endeavoured to bring together the whole of our present knowledge of microscopical beings, with their history in as complete a state as possible: it contains drawings of all the 722 species observed by the author up to 1835. A copy of this work has been submitted to the British Association, the Professor, at the same time, exhibiting earths which are entirely formed of the shields of some infusoria. Next was mentioned the eatable infusorial earth from Litthaggsjön, in Sweden, from Finland, and from Kliecken near Dessau, where they occur in great natural layers. Ehrenberg stated, that the greatest layer hitherto discovered was to the height of above twenty-eight feet, near Lunebourg; adding, that similar layers have already been found in Africa, Asia, and the South Sea Islands. The Professor has succeeded in preparing from still existing Infusoria very considerable quantities of earth; and he exhibited a large glassful, in which the microscope, however, still evidently and distinctly discovered all the forms of the Infusoria constituting such earth, pounds and tons of which may be easily prepared. Ehrenberg then briefly noticed the controversy between botanists and zoologists, both of whom would class in their catalogue these microscopic living forms; he also examined the reasons given in his work for each opinion, deciding himself in favour of their being animals.

The Professor next invited attention to the fact, that the luminosity (of the sea), in Infusoria and Annulata, is an evident voluntary production of sparks, so that in the latter there originates a light apparently continuous or tranquil to the naked eye, from numerous microscopic sparks following each other in quick succession. The analogy with electrical phenomena is very close; and it is especially worthy of attention that evidently the smallest animals give the largest sparks in proportion to the size of their body, and, consequently, very probably produce the greatest electrical tension.

Ehrenberg then mentioned the curious formation of double gems in *Closterium* and in the *Confervæ conjugatæ*, which is figured in the plates of the family of the *Closterinæ;* and concluded with some remarks on the astonishing great fertility or capacity of increase of microscopic animals, according to which an imperceptible corpuscle can become in four days 170 billions, or as many single individual animalcules as are contained in two cubic feet of the stone from the polishing slate of Bilin. This increase takes place by voluntary division; and this is the character which separates animals from plants. It is true, that the gemmation in plants, especially in very simple cells, is at times very similar to the division in animals, but this relates to the form, not to the formation. A vegetable cell apparently capable of self-division always becomes one, or contemporaneously many exterior warts (gems) without any change in its interior. An animal which is capable of division first doubles the inner organs, and subsequently decreases exteriorly in size. Self-division proceeds from the interior towards the exterior; from the centre to the periphery; gemmation, which also occurs in animals, proceeds from the exterior towards the interior, and forms first a wart, which then gradually becomes organized.

Professor Rymer Jones next observed, that notwithstanding he had taken great pains, yet he had never been able to see the structure described by Professor Ehrenberg of the interior organization, viz. of the alimentary canal of the polygastric Infusoria, although he had found the external forms to be exactly the same. He had not discovered any trace of an alimentary canal, and in *Paramæcium Aurelia*, and other species, he had observed a circular motion of the inner cells, which could not agree with the formation described by Ehrenberg; who, in reply, considered this a special not a general case. The mass of relations of organization, which after many years of observation have been gradually established, could not be brought into doubt by a single doubtful fact. The perfect organization of the wheel animalcules had been established beyond all question. But *Paramæcium Aurelia* is one of the forms unfavourable to such observations. This subject is treated of in detail in the great work of Ehrenberg, who exhibited in the drawings some of those forms in which the relations are perfectly evident; and the Professor, in conclusion, remarked, that the circular motion observed by Professor Jones had already been treated of by others, (for instance, Dr. Foeke,) and had naturally been observed by himself. The great contractibility of the body of the animalcule is, to less practised observers, often a cause of enigmatical phenomena, of which continued patient observation of the object will gradually bring the explanation. Thus, at times, the intestinal canal of the animalcule extends at the expense of the ventral sacs so far, that it occupies the whole space of the body, and then the devoured substances, very similar to the ventral sacs, circulate in the whole body.



Ideal figures of *Loxodes Bursaria*, in various states of the extension of the alimentary canal, and its inner circulation, not of the ventral sacs, but of the contents of the sacs voided into the canal. *a*, the mouth; *b*, the alimentary canal; *c*, ventral sacs; *d*, anal aperture.—*Abridged from Professor Ehrenberg's Letter to the Editors of the Annals of Natural History.*

MICROSCOPIC ANIMALCULÆ THE CAUSE OF PUTREFACTION.

A MEMOIR upon this subject has lately been presented to the French Academy of Sciences, by M.M. Beauperthuy and Adet de Roseville, the results of whose observations are as follow:

1st. When any animal substance is put into circumstances which favour putrescence, there is observed, after a certain time, varying according to temperature and moisture of the atmosphere, the formation therein of a number of *animalcules;* and that before any insipid or musty smell, (marking the first period of the putrid fermentation,) is perceptible; and even before the liquid presents any sign of an acid or alkaline state. These animalcules, which at first have the shape of *monades*, and then assume that of *vibrios*, derive their nourishment from the substance in which they are developed, and multiply it with the greatest rapidity.

2nd. At a more advanced period, when the liquid reddens litmus paper, the microscope shews us animalcules in immense number, and especially upon the brownish pellicle with which the surface of the liquid is covered. A considerable number of crystals are also to be seen mixed with the animalcules; and still there is no kind of unpleasant odour.

3rd. Somewhat later the fluid is observed to be more and more charged with detached particles of the animal substances which had been plunged into it: all these particles are formed of agglomerated animalcules attached to some fragments of the decomposing tissue, and this is the first epoch at which an odour begins to exist, faint at first, but speedily putrid.

4th. In the fourth and last period the animalcules shew themselves in tens of thousands, and the time arrives in which the whole mass becomes completely organized, and consists of nothing else than these elementary beings. By this time the liquid has become alkaline, and is extremely fetid.—*Comptes Rendus; Jameson's Journal.*

COMMUNICATION OF HYDROPHOBIA.

DR. HAXTHAUSEN, District Physician at Neissa, relates the following case of the communication of the Poison of Hydrophobia or Rabies from one human being to another. A servant received a slight wound from a young shepherd's dog in the right hand, and eight weeks afterwards, became affected with hydrophobia; although he placed implicit confidence in a quack remedy employed by the peasants in his neighbourhood, which was applied immediately after the accident. He had felt sharp pain proceeding from the cicatrix of the wound up the arm to his breast many days before the appearance of the disease. No vesicles appeared on the tongue, but there was swelling of the glands; and although he was in full possession of his senses, yet he had strange unaccountable feelings at intervals. The longer these periods lasted, so much the longer and the more stormy were the hydrophobic attacks. In one of these paroxysms, rendered remarkable by his spitting, biting, and scratching, he suddenly broke away from his attendants, and scratched the face of a servant-girl who was present. This girl, a strong-minded person, about twenty years of age, immediately washed her face, and thought no more of the accident, until she found herself some time after, indisposed; and hydrophobia soon set in with all its symptoms. The attacks came on periodically, and were characterised by wild shrieking, and a wish to bite and spit as well as destroy everything. The fits gradually became slighter, and at length assumed the nature of epileptic convulsions; which latterly were principally excited by some remembrance of the man, who had died. The medical treatment, after the abstraction of blood, had been of a simple nature.—*Dublin Medical Journal.*

WILD CATTLE OF CHILLINGHAM PARK.

MR. L. HINDMARSH has read to the British Association an interesting account of the character, habits, and origin of the wild cattle in Lord Tankerville's park, at Chillingham. They retain, he stated, preeminently all the characteristics of wild animals: they hide their young; feed at night, basking or sleeping during the day; they are fierce when pressed, but generally very timid. They, however, vary much in different seasons of the year, and according to the manner in which they are approached. In summer, for instance, for several weeks, they are scarcely to be seen; and on the slightest appearance of any human being they retire into the wood. On the other hand, in winter, they go down for food into the inner park, and, being in constant contact with the people, will almost let them come among them, particularly if on horseback. Their usual mode of retreat is, to get up slowly, set off in a walk, then in a trot, and afterwards in a gallop. In form, they are gracefully shaped; short legs, straight back, thin skin, and horns of very fine texture; some of the bulls are of a cream colour, and they have a peculiar cry, more like that of a wild beast than of ordinary cattle. They, also, have all the marks of high breeding, and some of its defects. They are bad breeders, and are subject to the rush, a complaint common to animals bred in and in. When they come down to the inner park, which they do at stated hours, they move like a regiment of cavalry, in single file, the bulls leading the van; and, as they retreat, the bulls also bringing up the rear. There are at present in the herd at Chillingham Park about eighty cattle, viz. twenty-five bulls, forty cows, and fifteen steers, of various ages. The eyes, the eye-lashes, and the tips of the horns are black. The bulls have no mane, but a little coarse hair; and they fight for supremacy, until a

few of the most powerful subdue the others. The calves suck their mother nine months, and, when first born, are hidden in some sequestered spot for a week or ten days, to which the mothers go twice or thrice a day, to give them milk. Should any one approach the calves, they clap their heads to the ground, and lie in the form of a hair. They seldom live more than eight or nine years.—*Literary Gazette.*

WOLVES IN WINTER.

ONE of the natural consequences of the protracted severity of the frost, and the great depth of the snow, of last winter, was the extreme boldness and destructiveness of wolves, which killed great numbers of men and cattle, made inroads into provinces where they had long been extirpated, and penetrated even into populous cities.

As early as the middle of January, many wolves appeared in the neighbourhood of Stuttgart, either from France or Switzerland; and they devoured a boy twelve years of age, at about five English miles from that city. In all parts of Hungary, the wolves prowled about in packs: in the night of February 7, ten of them forced their way into a farm in the village of Lekenek, near Agram, whence they were not dislodged until they had severely wounded eight head of cattle. The eastern provinces of Prussia were much infested by the wolves which crossed the frozen rivers from Poland. They were warmly received by the Prussian foresters; but one of them assailed a horse in one of the busiest streets of Königsberg, on February 27; the wolf was immediately attacked, but escaped. —*Dr. Weissenborn; Mag. Nat. Hist.*

THE DEVIL. (DASYURUS URSINUS.)

THIS species exists all over Van Diemen's Land, is very destructive to sheep, and is, indeed, the most destructive of the indigenous quadrupeds of the colony. It is nocturnal, very fierce, and a match for an ordinary dog; its bite is very severe.—(A living specimen of this animal was exhibited a few years since at the Surrey Zoological Gardens.)

THE WILD ASS.

THE following notes of a paper by Colonel Sykes, lately read to the Zoological Society, "On the Identity of the Wild Ass of Cutch and the Indus, with *Equus Hemionus* of Pallas," are curious. There are two of these animals in the Gardens at the Regent's Park, which are well known by their great beauty, fine condition, vivacity, and wickedness. One of them was sent, when quite a colt, to Bombay. It was allowed a considerable period, (pending an answer from Col. Sykes, whether or not he would accept of it,) to amuse the children: it was permitted to attend at breakfast time, and eat from the table; but manifesting, as it grew up, symptoms of ill-nature (no doubt having been much teazed), it was put on board the Marquess of Hastings, Captain Clarkson, and sent to England, and afterwards presented to the Society. Colonel Sykes's scientific details establish the identity of the animal with the *Equus Hemionus* of Pallas. M. St. Hilaire's humorous description of the habits of kicking of the female of the same species, at Paris, is laughably exact with regard to the animals at the Regent's Park. With respect to the swiftness of the wild ass of Cutch, without quoting from Griffith, "that it runs literally with the rapidity of lightning," or from St. Hilaire, who says, "it appeared to him to go as fast as the best race-horses," the Colonel mentions, in confirmation of its extraordinary swiftness, that his friend,

Major Wilkins, of the cavalry of the Bombay army, who was stationed with his regiment for years at Deesa, on the borders of the Run, or Salt Marshes, east of Cutch, in his morning rides used to start a particular wild ass so frequently, that it became familiar to him, and he always gave chase to it; and, though he piqued himself upon being mounted on an exceedingly fleet Arabian horse, he never could come up with the animal. —*Abridged from the Literary Gazette.*

THE PURIK SHEEP.

THIS animal would be an invaluable appendage to the cottage of the British peasant, as it could be maintained at scarcely any cost. "During the day, in summer, it pastures among the mountains, but at night, and throughout the winter, it finds shelter in a walled yard, or under the roof of its master. In this state it seeks, with incessant assiduity, grass, straw, chaff, grain, peelings of esculent vegetables, and always attends the meals of the family for morsels of flour-cake, barley-meal, tea buttered and salted, or exhausted tea-leaves, and will sometimes even nibble a bone."—*Moorcroft's Travels in Ladakh and Kashmir.*

INDIAN SHEEP.

CAPTAIN BURNES has lately purchased, on account of Government, several large flocks of valuable sheep from the countries to the westward of the Indus. From these the quality of Indian wool will be very much improved, and a new impulse given to the commerce of the country.—*Parbury's Oriental Herald.*

ZEBRA ANTELOPE.

THE British Museum has lately purchased a perfect skin of the *Antelope Zebra*, Gray, which was sent direct from Sierra Leone. Its back is bright fulvous fawn with broad glossy black transverse stripes, beneath pale fulvous; outer side of legs grey brown, darker beneath. It is certainly the most brilliant of the beautiful genus of antelopes.—*Mr. J. E. Gray; Annals of Natural History.*

NEW ANTELOPE.

ON January 9, was exhibited to the Zoological Society, a very large and beautiful Antelope, of a species hitherto entirely unknown, which had been received from the interior of Africa, discovered by Captain W. C. Harris, of the Bombay engineers; who describes it as belonging to the sub-genus *Aigocerus*, and in form, as well as in other respects, remotely resembling the *Aigocerus Equina* (Roan Antelope or Bastard Gemsbok), with which it has often been confounded. During three months' hunting over the country lying between the twenty-fourth and twenty-sixth parallels of south latitude, within 28° and 30° east longitude, Captain Harris only once met with this Antelope. On the northern side of the Cashan range of mountains, about one degree and a half south of the tropic of Capricorn, he found a herd of nine does and two bucks, one of which he captured. It is doubtless, very rare; and judging from the formation of its foot, entirely confined to the mountains. The females are somewhat smaller than the males, are provided with shorter and slighter, but similarly shaped horns, and are similarly marked; a deep chestnut brown, verging upon black, taking the place of the glossy black coat of the male. In the description sent with the specimen, it is designated *Aigocerus Niger*, the Sable Antelope: its height at shoulder,

fifty-four inches; length of body, forty-four inches; length of tail, twenty-five inches; length of horns, thirty-seven inches; length of ears, ten inches. It inhabits the great mountain range which threads the more eastern parts of Moselekatses territory.—*Proc. Zoolog. Soc.*

ANATOMY OF THE GIRAFFE.

PROFESSOR OWEN concludes a paper on this inquiry by observing that "the order *Ruminantia,* perhaps the most natural in the mammiferous class, if we look to the conditions of the organs of nutrition, presents more variety than any of the carnivorous orders in the local developement of the organs of relation, and the consequent modification of external form: the most remarkable of these modifications is undoubtedly that which we admire in the Giraffe, and the anatomical peculiarities which its internal organization presents are principally confined to the skeleton in respect to the proper proportions of its different parts; and to those parts of the muscular and nervous systems immediately relating to the local peculiarities in the development of the osseous framework."—*Proc. Zoolog. Soc.*

CAPRICORN CAUGHT IN SWITZERLAND.

NEAR Wattenburgh, not far from Seftingen, in the canton of Bern, early in April, a fine specimen of the Capricorn was caught, but restored to liberty, in consequence of the legal enactments. A Swiss locality, where this rare animal is still said to breed, is the forest of the Gowmigel, near Bern.—*Mag. Nat. Hist.*

THE MARSUPIALIA.

MR. OWEN has submitted to the British Association the results of his investigation of the economy of these animals. The report is drawn up under three heads: first, the zoology of Marsupiæ; secondly, their relation to other Mammalia; and, thirdly, the peculiarities of their reproductive economy. 1. With regard to their zoological characters, they present as many forms, and as varied habits, as all the Carnivora put together. In their kind of food they are very various. Some are entirely carnivorous, as those of New Holland. Some are insectivorous, as the Chæropus and Myrmecobii. A species of these is described by Captain King, as having a divided hoof like the Ruminantia. Some of them are arboreous, as the Didelphes and Perameles. Many of the Marsupialia are strictly herbivorous, as the kangaroo-rat, &c. With all the varieties of character and habit presented by these animals, they have been too largely subdivided by zoologists. 2. In regard to their relation to other animals, they ought to be considered as one group: for although they differed greatly in some respects, still, they agreed in many remarkable points. Of these points the most remarkable are the development of the hind legs, the existence of the marsupial bag, the circulatory apparatus being less perfect than the rest of Mammalia, the blood being returned to the heart by two veins, as in the hearts of reptiles and birds; and in the hemispheres of the brain, which are not united by a corpus callosum: in this last respect, they are like the oviparous division of vertebrate animals, a fact first pointed out by Mr. Owen. In this they have the same relation to Mammalia, that the Batrachian have to the Ophidian, Saurian, and Chelonian, divisions of reptiles. 3. The reproductive economy of these animals was slightly touched upon. It had been supposed, that the young were produced by budding from the marsupial pouch, but this

was now proved to be erroneous, and the first stages of their uterine growth were known to be like that of all other Mammalia.

Mr. Owen then entered into some geological account of these animals. Dr. Buckland had found the jaw of an animal in the Stonesfield strata, which, from a peculiar mark only seen in the jaw of Marsupialia, could be well identified, and probably belonged to the present genus Opossum, or Didelphis. Major Mitchell has in his collection a large number of bones, belong to extinct genera of Marsupialia. From the jaw of one of these animals, there is reason to conclude, that its possessor must have been double the size of any species of kangaroo existing at the present time.—*Athenæum.*

OSTEOLOGY OF THE MARSUPIALIA.

On October 9, Mr. Owen read to the Zoological Society, an elaborate paper, descriptive of the Osteology of the *Marsupialia,* when the author remarked upon the great value of an acquaintance with the structure of the skeleton in determining the genera and species of this group of animals, and proposed a new genus, *Thylacomys,* for certain species presenting a peculiar conformation of the cranium. In treating of the maxillary bones, Mr. Owen said he was induced to enter more largely into details, from the great interest attached to the fossil jaw found in the oolitic strata at Stonesfield, and the doubts which had lately been expressed by M. de Blainville as to its true mammiferous character. Mr. Owen had examined four specimens, of which one is in the Museum at York, another in the collection of Mr. Broderip, and the other two in the possession of Dr. Buckland. The double fangs to the molar teeth, and the ramus of the jaw being formed of a single bone, Mr. Owen thought, sufficiently attested the mammiferous nature of these remains; while minor anatomical characters led him to regard them as belonging to a marsupial genus.—(*See the Geological Section.*)

RARE SOUTH AMERICAN ANIMAL.

Colonel Sykes has read to the British Association, a paper upon the animal described by Azara, the Spanish naturalist, as *Canis jubatus;* but which, from this description, Colonel Sykes supposes ought not to be placed in that genus. It differs from the dog in its nocturnal and solitary habits; its tail is thicker, more bushy, head flatter, eyes smaller, nose sharper, and the whole animal more bulky than the dog tribe. It differs still more from the fox and wolf; and Colonel Sykes proposes to refer it to the genus *hyæna,* or if this be not admitted, he would make it a distinct genus, which would then be the representative of the hyæna tribe in America, which, we must suppose, possesses some analogy to that tribe in the Old World. The Colonel also exhibited the skin of an European *felis,* which Temminck states, is known as the lynx of Portugal: it is not, however, known by this name amongst London furriers.

WALKING OF THE SEAL.

The common Seal in the menagerie of the Zoological Society, when on the land, scarcely uses its feet in walking, but only the abdominal muscles, jerking itself forward by a series of convulsive actions. It only uses its fore-feet to assist in balancing itself, and when it turns on one side it expands its hinder feet, which are generally contracted and held together, with the depressed forked tail between their base. This does not arise from any imperfection in the formation of the fore-feet, for it

uses them as hands to bring bodies near to its mouth.—*Mr. J. E. Gray; Annals of Natural History.*

GRAMPUS.

On October 5, a Grampus, (*Delphinus Globiceps,* Cuv. *D. Deductor,* Scoresby,) was taken in Campbelton Bay, measuring twenty-seven feet seven inches in length, and eleven feet five inches in circumference.

RARE BRITISH DOLPHIN.

The fact that troops of four or five individuals are frequently seen in company off the southern coast of Devon, sanctions the inference that *Delphinus Tersio* ought to be considered as an indigenous species; whilst a probable reason for its extreme rarity may be found in the enormous locomotive powers which it possesses, swimming with inconceivable velocity in pursuit of prey, or seeking refuge from an enemy, in the depths of the ocean. On Sept. 3, one of a troop of four dolphins of the above species was shot by a party sailing off Torquay; and the animal when towed ashore by seven men, proved to be a female, measuring eleven feet in length, and five feet six inches in circumference at the dorsal fin. The body was of a bright bluish black above and along the flanks, and of a pure white beneath. The skin was first carefully dissected off, leaving the skull, fins, and tail *in situ.* The adipose layer yielded about five gallons of good oil. The skin, when freed from the *viscera,* weighed 120lbs. and was presented to the Museum of the Cheltenham Literary and Philosophical Institution. The specimen was forwarded to Mr. E. Wright, M.R.C.S. for inspection, who states that no individual of the same species had ever been seen ashore by those who are well acquainted with the oceanic natives of the Devon coast. The dimensions of this fine specimen, with details of its economy, have been contributed by Mr. Wright to the *Magazine of Natural History,* No. 23.

MACROSCELIDES.

The curious insectivorous mammal, called *Macroscelides,* which inhabits the rocky mountains of the western part of the district of Algiers, has been recently observed by M. Wagner. It inhabits the crevices of rocks, and makes its bed in the underwood of the dwarf palm; it eats the larvæ of insects, grasshoppers, and terrestrial mollusca, introducing its rostrum into the snail shells before the animal has time to retreat. It is remarkably gentle, only expressing uneasiness by a low sound, something like a sigh. It raises itself on its hind legs when it hears any sudden noise, and also leaps upon its prey, but never walks solely on two legs like the Jerboa. It disappears in the rainy reason, and during the great heat.—*Athenæum.*

NEW AFRICAN BIRDS.

Three new genera of birds hitherto unknown to science, have been sent from Madagascar by Mr. Bernider, to the Museum of Natural History, in Paris. M. Isidore Geoffroy St. Hilaire has named them *Philepitta, Oriolia,* and *Mesites.* The latter is the most curious, as it bears affinity to pigeons by its feet, to the *Gallinaceæ* by its wings, and by its beak and nostrils approaches a genus of the *Palmipedes.* The *Philepitta* refers to the *Passeres,* and bears the specific name of *sericæ;* the *Oriolia Bernieri* to the *Orioli* among the *Passeres;* and the *Mesites* will, probably, form the type of an entirely new family.

ORNITHOLOGY OF AUSTRALIA.

MR. and MRS. GOULD have sailed for Australia with the object of preparing for publication the Ornithology of that Continent, on the same magnificent scale as that on the birds of Europe; while nearly the whole of the illustrations will be of species previously unfigured.

THE APTERYX.

A RECENT part of Mr. Gould's work on the Australian Birds, contains an admirably executed representation of the *Apteryx*, two excellent specimens of which, supposed to be male and female, have lately been presented by the Association for Colonizing New Zealand, to the Museum of the Zoological Society. The Society has also very recently received as a donation from the Earl of Derby, the body of this most extraordinary bird, in a fit state for anatomical investigation; so that the scientific world is likely soon to be in possession of the relations exhibited by its skeleton and soft parts, to the struthious genera, with which it is thought to be allied.—*Mr. Charlesworth; Mag. Nat. Hist.*

EDIBLE SWALLOWS' NESTS.

THESE nests are very little subject to putrefaction; their decomposition, in the opinion of Dr. Weissenborn, being arrested by the saltpetre on the surface of the rocks where the swallows build, as well as by the sea-salt and spray with which the nests are impregnated during their construction. Caverns which were formerly constantly dripping with dissolved saltpetre, and where a few of these birds used to build, have been forsaken by the latter after saltpetre had ceased to form there, and the nests fast crumbled off. This may also be the reason why these birds construct their nests in such vast numbers on a few particular cliffs, though there be numbers at hand, but destitute of saltpetre.—*Mag. Nat. Hist. abd.*

HYBERNATION OF SWALLOWS.

M. DUTROCHET, during his recent scientific expedition to the North, found two swallows in a state of torpor, in a recess formed in the wall of a building. On being warmed by the hand, they flew away, proving thereby that swallows are occasionally capable of wintering in a northern climate. To this M. Larrey adds, that in the valley of Maurienne, he saw a deep grotto in a mountain, called L'Hirondellière, because it is covered with swallows at the beginning of winter. In this the birds were suspended, like swarms of bees, in the corners of the roof. —*Athenæum.*

ALBINISM IN A SWALLOW.

IN the Museum of Carcassone is preserved a young swallow of the purest white, without a feather of any other colour, which was recently killed in that city. This bird was one of a brood of four, of which the three others were of the common kind. It has all the characters of albinism; the claws, beak, and eye-circles being red.

GYPAETOS BARBATUS.

IN August last, a specimen of the *Gypaëtos Barbatus* of immense size was shot among the rocks of the Stockhorn mountain, in Switzerland. Its height was more than three feet, and it measured above ten feet from tip to tip. This is supposed to be the same individual which was observed

in May, 1837 and 1838, near St. Maurice, in the canton of Wallis, whence it carried away two children; its nest being discovered, during the absence of the old birds among the rocks of the Dent du Midi, its two young were taken out of it; the latter were then six or seven weeks old, but measured two feet in height, and eight feet from tip to tip. The first child which the bird destroyed in 1837 was a girl seven or eight years old; and in the following year a child disappeared in the same neighbourhood; in both cases, the shoes and parts of the children's dress being found. The shoe of a child is stated to have been discovered in the aery on the Stockhorn; and, if it belonged to the child last mentioned, the latter must have been carried through the air at a distance of fifteen leagues over the mountains of the Pays de Vaud, the Saanerland of Bern, and the Simmenthal.—*Dr. Weissenborn; Mag. Nat. Hist.*

THE GUACHARO.

A NEW habitat has been found for the curious bird called the Guacharo (*Steatornis Caripensis*), and Dr. L'Herminier and M. Hautessier have completed its history. The latter has met with it in Spanish Trinidad, where it is sold under the name of Diablotin, and even the church allows it to be eaten on meagre days. The mountains which border the north of this island are a continuation of the chain of Cumana, interrupted by what are called the Dragon's Mouths—little islands torn asunder by the violence of the currents, and which are all hollowed into deep caverns. The north side of the chain is, on the contrary, cut vertically like a wall, and is unceasingly worn and beaten by an agitated sea. In the sides of these are caverns inhabited by the Guacharo, all open just at the place to which the waves rise, and in the most exposed and dangerous to the fowler these birds chiefly abound. They eat the seeds of palm and other trees, fly abroad at night, and return to their caverns at the point of day. They lay their eggs in March and April, and at each period produce from two to three eggs, the size of those of a pigeon, white, and spotted with yellow. The nest, in shape, resembles the great boletus, from which tinder is made, and is so little hollow in the middle, that it is probably surrounded at the edge by a pad of down, when required to hold the eggs or young birds. It is fixed to the rock like a cornice, and lasts several years; it is formed by masticated and digested materials, placed by the beak, and kneaded with the feet; and, when broken, looks like a cake of sawdust, or tan, and burns like peat, without any decided animal odour.—*Athenæum.*

THE STORMY PETREL.

ON November 6, it was stated to the Linnæan Society, by Mr. Couch, that Wilson's Petrel had recently been found dead in a field, near Rolperro, in Cornwall; the first instance in which this rare bird has been known to visit our shores.

THE GREAT BUSTARD.

LATE in the spring of 1838, was shot near Dereham, Norfolk, a fine specimen of that rare and nearly extinct bird, *Otis tarda* of Linnæus. It was a female, in excellent plumage.

SPEAKING CANARY-BIRD.

IN the *Annals of Natural History* (May,) is recorded the novel fact of the power of articulation having been acquired by a Canary-bird in the

possession of Mr. Hardy, of No. 28, Piccadilly, by whom it was brought up from the nest. This docile little creature has certainly learnt to imitate with surprising success some phrases which had often been addressed to it, and possesses a faculty which had never been suspected in the family to which it belongs.

PROBABLE CAUSE OF THE DEATH OF CAGE BIRDS.

MR. D. COOPER having opened and inspected a Cockatoo, which was supposed to have been poisoned, found the gizzard full of small pieces of brass and iron wire, variously twisted, with five pebbles, about the size of peas. The bird had been sickening for some time, owing, doubtless, to the wire acting as a poison; and the gizzard was much inflamed and corroded, and in some parts entirely destroyed, by the acridity produced by the metal. Neither sand, gravel, nor similar articles necessary for the trituration of the food in the gizzard, had been placed in the cage, else the life of the bird would undoubtedly have been prolonged. The saw-dust with which the cage was strewn not offering sufficient resistance to accomplish the desired end, the bird instinctively picked the smaller pieces of wire, used to bind the cage together, to compensate for this deficiency; and much instinct was shewn in the manner in which it had folded the pieces of wire, in order to swallow them; most of them when thus doubled and twisted measured one-third of an inch in length, but when unfolded, nearly one inch.—*Mag. Nat. Hist. abd.*

THE LONG-TAILED TROGON.

SOME observations on this species, by Charles Lucien Bonaparte, Prince of Musignano, have lately been read before the Zoological Society. This bird, also named the Queralt, is celebrated among the Indians of Guatemala, as one of the most magnificent productions of nature, and worthy of being called the bird of paradise of America. It was long sought after to enrich our collections, but rarely met the eye of any experienced naturalist. In 1826, it was registered by the author in the catalogues of science, under the name of *Trogon paradiseus*, Paradise Curumi.

The principal singularity of this bird consists in the upper tail coverts, which are loose in their texture, as is the general plumage; and all of them have a tendency to prolongation, which is most conspicuous in the lowest, four of which extend beyond the tail; two of them measuring more than thrice the length of the body; the shortest pair of these lengthened plumes measures one foot, the other more than two. Not only the casual observer, but even naturalists, would at first sight mistake these ornamental plumes for a portion of the tail.

NOTE OF THE TRUMPETER BIRD.

THE origin of the note of this bird, (*Psophia crepitans, Linn.*) and the Waracoba of Guiana, has been much disputed by naturalists. The bird may with propriety be regarded as a ventriloquist; the sound of its note actually proceeding from its belly, although by some naturalists supposed to proceed from the anus, whence its Linnæan name. Dr. John Hancock states in a communication to the Zoological Society that the male only utters this sound, the cause whereof is evident in the peculiar structure of the trachea or windpipe, which runs down the belly immediately under the skin, to within about an inch of the anus, where it is doubled back upon itself, returns and enters the cavity of the chest, at the anterior part

of the breast-bone. No dissection is required to ascertain this point; for the trachea may be plainly felt under the skin of the abdomen, and the male and female may be thus distinguished. There is nothing very peculiar in the structure of the larynx, as observed in some birds of song.

THE HOOPOE.

THE Hoopoe is by no means so difficult to maintain in health in captivity, as has been generally stated. The Earl of Derby has possessed living specimens for some years; a pair of which built and incubated last season. It is to be regretted that the cupidity of collectors prevents this interesting species from effecting a permanent settlement in the British Islands, which it certainly would do, if allowed to breed unmolested; for specimens are obtained every season in different parts of the country, and some few cases have occurred of their multiplying in the southern counties. The geographic range of the form extends, during summer, nearly throughout Asia, Europe, and Africa, including some of the islands of the Indian Ocean; the number of species, however, would appear to be limited to two, or at most three, which are very intimately allied, and barely distinguishable.—*Mr. Blyth; Mag. Nat. Hist.*

THE KINGFISHER IN ENGLAND.

A VERY general opinion prevails as to the scarcity of the Kingfisher in England. This, however, is owing to the shy nature of the bird, and to the small attention paid to Natural History by the majority of our countrymen. The assertion of some, that it is extremely common, is, on the other hand, equally erroneous. The fact is, that it is equally, but rather sparingly, distributed throughout the country, so that it may, perhaps, not often be noticed, save by the observing ornithologist. That a bird equalling in the splendour of its plumage the brightest ornithological genus of tropical climates should be indigenous in our comparatively northern regions, is certainly not a little remarkable. The majority of British birds, as almost every one knows, are plainly attired; but the plumage of many of them is, nevertheless, extremely handsome.—*Naturalist.*

THE PEREGRINE FALCON

Is not an uncommon bird on the Welsh coast, rearing its young on shelves of rock overhanging the sea. Mr. T. C. Eyton has never observed nests nearer to one another than two miles. Two or three specimens have occurred in Shropshire. "I have several times," adds Mr. E. "succeeded in training the young bird (the lanner of Fleming and Pennant,) for hawking pigeons and partridges, and found the process much easier than I could have supposed from the accounts of it given in the older books on the subject; indeed, excepting the treatise by Sir John Sebright, there is not more humbug contained in any description of books than in those on hawking."—*Annals Nat. Hist.*

THE ICELANDIC FALCON.

MR. JOHN HANCOCK, of Newcastle, has read to the British Association some remarks on the Greenland and Icelandic Falcons, shewing them to be distinct species, and thus clearing up a long-disputed point with ornithologists.

THE COLUMBIDÆ. (PIGEONS.)

On June 11, Mr. P. Duncan read to the Ashmolean Society some notes on the Columbidæ. These birds, arranged by Cuvier, under the order Gallinæ, may be considered as a link between the Gallinaceous and Passerine birds. Only one genus of them has been recognised, which is subdivided into three sub-genera, according to the relative strength of the bill and proportions of the feet. There are upwards of one hundred species, fifteen of the gallinaceous pigeons, eighty-six of the ordinary, and ten of the Vinago. None of the division, Vinago, have been found in Europe, North Asia, or either of the Americas. The pigeons with the slender bills are not found in Europe, where the most prevalent variety are the common pigeons, with moderate bills. The Gallinaceous, distinguished by their short and robust bills, are found in Africa, the islands of the Indian Archipelago, and the South Sea, and in New Holland. Only four species of the common pigeon' are found wild in Europe, from one of which, supposed to be the Biset, are descended all the varieties which are found domesticated. It is to the pigeon that the multiplication of the nutmeg tree is referred, as the bird does not digest the seeds of certain fruits. Of the Gallinaceous, the Great-crowned Pigeon, or Gouza, bears the greatest resemblance to the Gallinæ in size; it is a native of New Guinea, and various isles of the Eastern Archipelago. The Nicobar pigeon is distinguished for its brilliant plumage: it runs along the ground, and builds its nest like a partridge's: it inhabits Sumatra, Nicobar, and other islands in the east. Of the ordinary pigeons, the ring pigeon is the largest, and is migratory: it prefers larch to beech or oak woods. The stock pigeon has an affinity to the former kind, but flies in large flocks, and emigrates about October. The Biset lives in flocks, and nestles in the holes of trees, and in rocks. Pigeons range to a great distance for food, particularly for salt. They are much distressed by excess of cold or heat. They lay, in general, two eggs, two or three times a year, and both the male and female sit upon the eggs. They feed their young from their mouth, either with half macerated food, or a secretion, from which " Pigeons' Milk."

FLIGHT OF PIGEONS.

In July, thirty-two male pigeons were brought to Dresden from Herve, between Liege and Virviers, and were let loose, after having been marked. Only two of them reached Herve. The distance is 320 geographical miles (sixty to a degree), the mean quickness of their flight being calculated at 860 ft. (390,000 to a degree,) a minute.—*Dr. Weissenborn; Mag. Nat. Hist.*

OSTRICHES' NESTS.

According to native testimony, the male ostrich sits on the nest, (which is merely a hollow space scooped out in the sand,) during the night, the better to defend the eggs from jackals and other nocturnal plunderers: towards morning, he *brummels,* or utters a grumbling sound for the female to come and take his place; and she sits on the eggs during the cool of the morning and evening. In the middle of the day, the pair leaving the eggs in charge of the sun, and " forgetting that the foot may crush them, or the wild beast break them," employ themselves in feeding off the tops of bushes in the plain near the nest. Looking aloft at this time of day, a white Egyptian vulture may be seen soaring in mid-air, with a large stone between his talons. Having carefully surveyed

the ground below him, he suddenly lets fall the stone, and then follows it in rapid descent. Let the hunter run to the spot, and he will find a nest of, probably, a score of eggs, (each equal in size to twenty-four hens eggs,) some of them broken by the vulture. The jackal is said to roll the eggs together to break them, whilst the hyæna pushes them off with his nose to bury them at a distance.—*Sir J. E. Alexander's Expedition of Discovery.*

BRITISH GEESE.

On May 5, Mr. Blyth exhibited to the Ornithological Society, specimens of three wild British geese allied to the domestic breed, namely, the grey goose (*Anser cinereus,*) the bean goose (*A. Segetum,*) and the white-fronted goose (*A. Albifrons,*) all which are promiscuously sold in the markets under the general name of "Wild Goose." The first of these was stated to be the primitive stock of the domestic goose, and to have become of extremely rare occurrence in the British islands, although it formerly bred plentifully in the fens. Until very lately, no specimen of it existed, that Mr. Blyth could learn, in any of the London museums; but aged examples of the bean goose, that had the terminal nail (*dextrum,*) of the bill white, were ticketed with its name. It differed, however, in various particulars, which were pointed out, and might always be at once told by the pale grey colour of the rump, which, in both the others, is very dark brown. The bean goose was mentioned as the ordinary wild goose of the islands, which it annually visits in large flocks, frequenting upland pastures, where neither of the others are ever seen. It was the only species of the three brought to market during the continued severe weather of last winter, when thousands of them were daily exposed for sale. In ordinary winters, the white-fronted goose is the most frequent in the markets. Though the bean goose had never previously been known to breed when domesticated, it was stated that two females were then incubating on one of the islands of St. James's Park, a fact the more interesting as they enjoyed the full use of their wings.—*Analyst.*

NEW SWAN.

On February 13, Mr. Yarrell exhibited to the Zoological Society a recently preserved example of a new species of swan, closely allied in external appearance to the well-known domestic swan, but having the legs, toes, and interdigital membranes of a pale ash-grey colour, which in the *cygnus olor.* Ill., are deep black. This species had been known to Mr. Yarrell for some years past as an article of commerce among the London dealers in birds, who receive it from the Baltic, and distinguish it as the Polish swan. In several instances, these swans had produced young in this country, and the cygnets when hatched were pure white, like the parent birds, and did not assume at any age the brown colour borne for the first two years by the young of all the other known species of white swans. Mr. Yarrell considered this peculiarity sufficient to entitle the bird to be ranked as a distinct species, and in reference to the unchangeable colour of the plumage, proposed for it the name of *cygnus immutabilis.*

During last winter, flocks of this swan were seen pursuing a southern coast along our north-east coast, from Scotland to the mouth of the Thames, and several specimens were obtained. That exhibited was shot on the Medway, where one flock of thirty, and smaller flocks, were seen.

AGED PARROT.

A German paper mentions, that a merchant of Amsterdam has been in possession of a grey parrot for the last thirty-four years, after a relation had had the same bird forty-one years. This would make its present age seventy-five years, exclusively of the age it had when it was brought to Europe. It is now in a complete state of *marasmus*. Its power of vision and memory are gone, and it is constantly dosing. In youth this bird was a prodigy of loquacity. At sixty its memory began to fail, it could not be taught anything new, and it jumbled the phrases it knew in a most ridiculous manner. Till sixty it regularly moulted once a year, and the last time, the red feathers in the tail were exchanged for yellow ones.

AGED NIGHTINGALE.

Dr. Weissenborn relates that a nightingale, which had been caught in Germany in its adult state, lived nearly thirty years confined in a cage. One of the bird's owners, a tradesman at Weimar, who kept it for sixteen years, paid great regard to the bird's cleanliness, and *always* fed it on *pupæ* of ants, either fresh or dry, according to the season, with a few meal worms a day; and whenever the bird appeared unwell, a spider, if it could be obtained. It sung beautifully throughout the year, except in April and May, when it moulted.—*Mag. Nat. Hist. abd.*

FISHES OF THE CANARIES.

MM. Webb and Berthelot, having submitted their collection of fishes to M. Valenciennes, that able naturalist has found, that the ichthyology of the great Canaries, and the isolated islands of the Atlantic, Ascension, and St. Helena, although they are nearest to the coasts of Africa, closely agrees with that of South America. This agreement might be due to the currents, as far as the Canaries are concerned, but this reason cannot apply to Ascension and St. Helena, which are situated in the great current, which enters the Atlantic from the channel of Mozambique. M. Valenciennes announces the discovery of a new eel from Teneriffe, where it is the only fresh-water fish.—*Athenæum.*

FISHES OF THE CASPIAN SEA.

Prof. E. Eichwald, of Wilna, has communicated to the *Archiv für Naturgeschichte* a paper to establish that the Caspian is independent of the Black Sea, a conclusion founded upon its different Fauna. Most of the fish found in the Caspian sea are fresh-water fish; there are, however, several peculiar species from genera which hitherto have been observed in salt water only. Several new species of fish are described by the author; the most numerous tribe being the *Cyprinidæ*, some of which are quite peculiar to it. The sea is very poor in crustacea; it is also exceedingly poor in mollusca compared with the Black Sea, which is ascribed to the following cause;—that the sea is continually dissolving and taking up large quantities of salt, numerous beds of which occur in the neighbourhood, at Baku, Sallian, and towards the east coast, and in the hot summer the constant evaporation concentrates the salt water to such a degree as to render it unfit for the preservation of animal life.—*An. Nat. Hist.*

FISHES OF THE GANGES.

On May 26, Dr. Cantor read to the Asiatic Society some notes on

the fishes from the estuaries of the Ganges; in which he stated that not more than one half of the species he had seen between Calcutta and 21° N.lat., had been described by previous ichthyologists. The Doctor noticed some species not hitherto detailed, though eaten by the inhabitants, both European and native; and he stated, that as the animal food of the natives was almost restricted to fish, the fisheries of India were of the greatest importance. He then described the modes of fishing in the Ganges. One is practised when the fields are inundated, when they teem with fish. The natives then set traps of bamboo, which fill with fish almost as fast as they can be taken out. The fisheries are not extensive, owing to the distance from the market. Dried fish is imported from Burmah and Bombay, and consumed largely. From recent successful experiments in salting and preserving fish, it may be anticipated, that the Hindús inhabiting the banks of the Hooghly will soon be able to supply the large quantities of fish consumed in the country, which are now imported by the Arabs and Burmese.—*Athenæum.*

FISHES OF VAN DIEMEN'S LAND.

A FISH called the sea hedge-hog or porcupine, *(Diodon,)* is very abundant; on being brought to land it inflates itself into a perfect sphere, the skin is as tight as a football, and the spines erect and stiff in all directions from the body; and it continues so for some time.

The parrot-fish (*Ostracion*, Linn.) is so called from the shape of the head and mouth, and its beautiful colours.

The sea-horse is so called from a fancied resemblance of the shape of its head to that of a horse.—*An. Nat. Hist.*

GROWTH OF THE SALMON.

MR. JOHN SHAW, of Dumlunry, Dumfriesshire, has communicated to Jameson's *Journal* the result of some experiments "on the development and growth of the fry of the Salmon, from the exclusion of the ovum to the age of seven months;" this being one of the most important papers on the subject which has been published since 1800.

Mr. Shaw having previously performed some experiments to ascertain the range of the growth of the young salmon after its exclusion from the egg, those now described were begun after these trials had brought the whole arrangement tolerably perfect. Mr. Shaw made a series of small artificial ponds, having a run of pure water passing through them; and the lead bottoms gravelled so as to resemble as near as possible the water and spawning beds, and the resort of the young fry after they are hatched. Two salmon were taken from their spawning-bed in the Firth while just ready to deposit their spawn; these were made immediately to shed their spawn together, in a pool formed for the purpose by the side of the river, and the impregnated ova were afterwards removed to Mr. Shaw's breeding-pond. There it was hatched 101 days after impregnation; and at the age of six months, the young had attained the length of about three inches. From these results, Mr. Shaw considers that the young or fry do not proceed to the sea in the same year they are hatched, as has generally been supposed, but that they remain in the fresh water over the first winter; and migrate about the May following, or when about twelve or thirteen months old. The fry or young salmon have hitherto been supposed to migrate to the sea the same spring in which they were hatched from the egg; and, if it shall be hereafter proved that they do not leave the rivers for thirteen or fourteen months, is is evi-

dent that an immense destruction must take place during their continuance in the fresh water, a circumstance of great importance to the fisheries.

HERRINGS IN FRESH WATER.

It is not generally known, that in Dagenham Reach, are a great many herrings, which, though not sc large as those which are taken in sea-water, are of a very delicious flavour.—*Yarrell.*

THE ANCHOVY IN BRITAIN.

At a late meeting of the Swansea Philosophical Society, it was stated that the anchovy is caught in large quantities in Swansea and Oxwich Bays. On May 22, an anchovy was caught in the Thames along with whitebait, and exhibited to the Zoological Society by Mr. Yarrell.

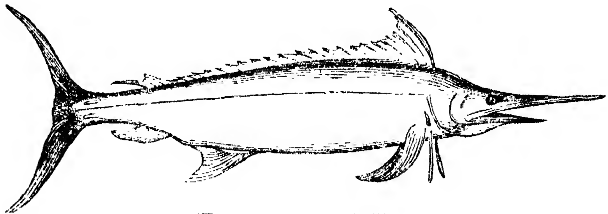
WHITEBAIT IN SCOTLAND.

Dr. Parnell has exhibited to the British Association specimens of whitebait, (*Clupea alba,*) which had been caught in the Frith of Forth. His statement was confirmed by Mr. Yarrell, and other ichthyologists, and thus proved the erroneousness of the assertion that this fish existed only in the Thames.

NEW TETRAPTERUS.

Cuvier describes a species of this genus from the coast of Sicily, first noticed by M. Rafinesque, and which, according to the Prince Charles Bonaparte, is found along the whole coast of Italy; and indicates two others, one from Sumatra, and the other founded on Makiara of Lacépède, which is probably only a specimen of *Tetrapterus Belone*, in which the observer had overlooked the ventral fins.

The specimen here figured greatly resembles Lacépède's *Makiara*,



(Tetrapterus Herschelii.)

and was brought to this country in 1837 by Mr. Smuts, author of a work on the Mammalia of the Cape of Good Hope, and sold by him to the Trustees of the British Museum, where it forms one of the chief ornaments of the ichthyological collection. Besides differing very considerably in the thickness and proportionate shortness of the body from the species figured by Cuvier (*Hist. Poiss.* viii. p. 228,) it has a peculiarity which distinguishes it at once from the Mediterranean species. The skin of the Cape species is strengthened with numerous elongate lanceolate flexible bones, varying from two to three inches in length, and sometimes united together by their outward surface. The fish having been discovered during the visit of Sir John Herschel, is named in honour of him,

Tetrapterus Herschelii. The upper beak elongate; the skin strengthened with bony spicula. Inhab. Table Bay, Cape of Good Hope. The specimen when stuffed, is nearly eleven feet long; the beak to the gape, is 2′ 8″; the lower jaw to the gape, 1′ 3″; the pectoral fin, 1′ 9″; the ventral fin, which is imperfect, nine inches; the crescent of the tail is four feet ten inches long. The first dorsal fin has eleven soft and twenty-nine spinous rays, and the second seven rays. The dorsal and anal fins are furnished with a deep fold on each side, between which they must be completely hidden when folded down.

A tail, which appears to have belonged to a larger specimen of this species, has been for many years in the collection in the British Museum. —*Mr. J. E. Gray; in An. Nat. Hist.*

ECONOMY OF THE PIPE-FISH.

THE discovery of the remarkable peculiarity existing in the sexes, by which the males are not only destined as protectors of the eggs and of the birth, but also are for this purpose endowed with a peculiar organ in which the eggs are deposited, developed, and hatched, and in which the young in their tender state find à sure protection, has obtained for this genus of late greater attention than would else have, probably, been the case. The Royal Swedish Academy contains in its Acts this beautiful discovery of C. M. Eckström, as also the anatomical observations of A. Retzius, which, besides explaining various interesting details respecting the internal structure of these fish, confirm the above discovery. Latterly, however, Mr. Yarrell has stated that the same discovery was made in 1785 by an Englishman of the name of Walcote, and is recorded in his unpublished manuscript.

With these observations, B. R. Fries opens an important paper on the genus *Syngnathus* (pipe-fish,) in which the author reduces the synonymy and nomenclature of the species in the Swedish and English Faunæ to a better arrangement than heretofore.—*See An. Nat. Hist.* No. 8.

A fine specimen of the *Syngnathus Æquoreus,* Yarrell, was found upon the sea-beach near Bamborough, in February; it measures eighteen inches and a half in length.

NEW SPECIES OF SMELT.

MR. YARRELL has described to the British Association a species of smelt, (*Osmerus,*) the more interesting from the circumstance that this fish is not only new to our country, but is also entirely new to ichthyology, no second species of the genus *Osmerus* having hitherto been made known. The fish in question was caught with a hand line in the bay of Rothsay, in the Isle of Bute, about 200 yards from the shore, in twelve fathom water; it is, though well kuown, but rarely seen; specimens vary from six and a half to eight inches in length; they are full of roe in June, and when first caught the cucumber-like smell is very apparent. The form of the body is elongated and slender; the lateral line straight; above it, the colour of the body is of a pale yellowish green; below it, is a broad longitudinal stripe of bright silvery white, passing by a shade of yellowish olive to an iridescent silvery white on the belly. To identify this species with the locality from which it was derived, it is proposed to distinguish it by the uame of the smelt of the Hebrides, *Osmerus Hebridicus.—Athenæum.*

NEW FISH.

Mr. Strickland, of Yorkshire, has communicated to the British Association an account of the capture of new species of fish, at Burlington Quay, on the 11th of August last. It was of the shark tribe, but it differed from those that have been usually met with. It was seven feet and a half in length, and three feet three inches round the girth. The skin was smooth and shining, and on the upper part of the back it had sharp spiles, not large in size, and about one inch asunder. It eyes were large, and hung over the mouth, and between the eyes were placed the nostrils. It was of a reddish slate colour when taken, but assumed a redder cast before it died. The author then described the anatomy of the fish, the result of which convinced him that it was a species not hitherto taken on the British shore. Mr. Yarrell thought it would be found to resemble one brought from Africa by Dr. Smith, and to belong to the genus *Saylbinum* of Cuvier; but Dr. Smith had found it necessary to subdivide that genus, and this animal might be referred to the group thus separated from the species originally placed in the genus.*

LIVING ELECTRIC EEL.

A living specimen of the electric eel, (*Gymnotus electricus*,) has been brought to this country from the Amazon river; and exhibited at the Gallery of Practical Science, Adelaide-street, Strand. On October 22, Professor Faraday, in the presence of Professors Daniell, Owen, Wheatstone, and others, succeeded in obtaining from it the electric spark; and one of the party, who had the temerity to grasp the creature with both hands, had his curiosity satisfied with a shock, which, if he were before incredulous, must have most effectually removed all doubts as to the electric properties of the animal. The electricity appears to be of the most intense character, being communicated by simply immersing the hands in the vessel of water containing the eel. By one shock, not only was the needle of a galvanometer deflected, but chemical action and magnetic induction obtained.—*Athenæum.*

Mr. Thomas Bradley, to whose care this *Gymnotus* was entrusted, has communicated to the *Magazine of Natural History*, an interesting account of its habits. The *Gymnotus* was received at the Gallery on August 12, in a very debilitated state. It was placed in an apartment, the temperature of which could be maintained at twenty-five degrees Fahr.; and, acting on the directions relative to its treatment, given by Baron Humboldt, in a letter to Professor Faraday, boiled meat cut small was put into the water for its food; but the animal would touch neither the meat, nor worms, small frogs, fish, nor bread, which were all tried in succession. The plan adopted by the London fishmongers for fattening the common eel—that of putting bullocks blood into the water in which they are kept—was then tried; and, the *Gymnotus* gradually improved in health. This treatment was followed till the end of October, when, on a few fresh gudgeons being thrown into the water, the animal darted at each, and swallowed it with avidity: and it has since been fed with gudgeons, one fish a day being its average; the blood diet being discontinued.

* It is worthy of notice that the shark exhibited as above by Mr. Strickland, is very closely allied to, and comes into the same genus as, a species of shark taken, though rarely, at the Cape of Good Hope; and figured in Dr. Smith's *Illustrations of the Zoology of South Africa*, Nos. 1 and 2 of which have been published during the past year.

Mr. Bradley then proceeds to inquire whether the animal's extraordinary electric power be given as a means of taking or securing its prey, or chiefly as a means of defence. When the eel is eager for food, if it see the prey distinctly, (for it has lost an eye,) it swallows it without giving it a shock; yet there is reason to believe that at the moment of seizing a fish, the eel discharges its electricity through the water, since a shock has been perceived by a person at that moment having his hands immersed in the tub in which the eel is kept. If the *Gymnotus* do not see the small fish, he appears to be aware of its presence, and seeks it; and during the motions of the two animals, if the fish happen to touch the eel, it generally receives a shock that paralyses it, causing the victim to float, belly upwards, on the surface, till it is noticed by the eel, who instantly swallows it.

Sometimes, a fish put into the tub will swim about, and even come into collision with the eel, without sustaining any injury; but at other times the eel has killed the fish on its accidentally touching him, and has taken no further notice of it. More than once the eel has swallowed a fish, and disgorged it in a second or two, perfectly uninjured.

It is curious to observe how the eel, after seizing a fish, turns it round in his mouth without letting it go, so as to swallow it head foremost; the rays of the fins impeding its progress down the animal's throat if he attempted to swallow it in the contrary direction.

Mr. Bradley has not observed any particular part of the eel, at which the shock is received by a single contact, as happens when the fish simply swims against the eel. In one instance, a perch eight or ten inches long, having the axis of its body in a line with that of the eel, was seized by the tail, and simultaneously received a shock which stunned it, and from which it did not recover for nearly twenty minutes.

Dr. Faraday has since reported to the Royal Society, his examination of this *Gymnotus*, and has come to the opinion that its electric power is identical with common electricity, though more readily developed.

In the several experiments with the gymnotus, copper cylinders were used wrapped in caoutchouc, so that the creature might be properly insulated, the galvanometer being used as a test of accuracy. The result was, that whilst the hinder parts were negatively electrified, the head and neck were positively so; and a series of electric sparks, as well as an elevation of temperature, were elicited. Indeed, the degree and frequency of the shocks were such, as to render them of a higher power than those obtainable from the galvanic battery.—*Proc. Royal Society, December* 13.

METAMORPHOSIS OF CRUSTACEA.

CAPTAIN DU CANE having been requested to report to the British Association,* on the metamorphoses of the *Crustacea* of the Southampton waters, has published the following observations relative to the metamorphoses of the ditch prawn *(Palæmon variabilis,)* and common shrimp, *(Crangon vulgaris.)* These changes, as shewn in the annexed engravings, are four in number, although the three last may rather be considered as a gradual and progressive development of the parts of the adult animal than an actual metamorphosis.

* This important communication arrived at Newcastle too late to be read at the meeting of the Association in September last.

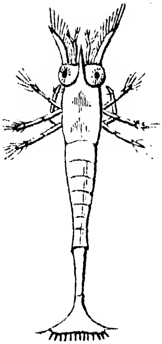


Fig. 1.

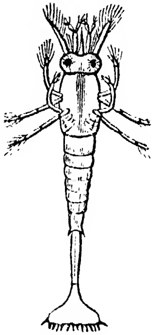


Fig. 2.

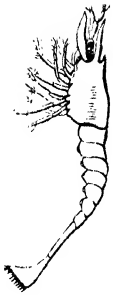


Fig. 3.

(Metamorphosis of Crustacea.)

Figures 1 and 2 represent the appearance of the larva on its first exclusion from the egg. 1, shews the animal as it appears in motion in the water; 2, as viewed when lying on its back, in which position the rudiments of the true legs are visible, doubled up under the thorax. Fig. 3, is the larva in its second stage, ascertained by observing the moult of the former. It has now one serrature on the dorsum of the cephalothorax; the eyes have become pedunculate. It has five pairs of natatory legs; and its proper legs, both walking and prehensile, are developed: the rudiments of subabdominal fins are becoming visible, but the tail continues spatulate as before.

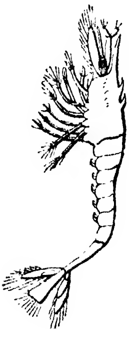


Fig. 4.

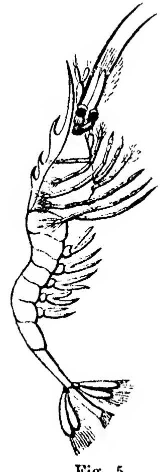


Fig. 5.

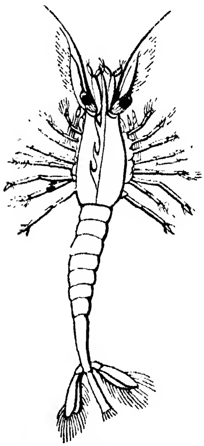


Fig. 6.

(Metamorphosis of Crustacea.)

Figure 4, is its third stage, also ascertained by witnessing the moult. The larva has now two serratures, or spines, on the cephalothorax; the legs are the same as in the second stage, but the subabdominal fins are more developed, and the tail has acquired two leaflets on each side, one of them being delicately fringed, the other still only rudimental.

Figures 5 and 6 represent the larva in its fourth or last stage, as it appears swimming in the water, and lying on its side. It is evidently the same animal as is drawn by Mr. Thompson, in Jameson's *Journal* for July, 1836. The larva has now three serratures, six pair of false, or natatory legs, and the true legs resemble those of the full grown or perfect prawn; the subabdominal fins are still further developed, and the tail also approaches nearly to that of the adult animal, which Captain Du Cane observed in the condition its next moult brings it to. It then becomes a true *Palæmon*.

It is a curious and interesting circumstance in tracing the changes of this larva to observe, that through all its conditions its movements are retrogade; but no sooner has it divested itself of this last envelope, and got rid of its natatory legs, than the subabdominal fins, which have hitherto been unformed and useless, come out ornamented with a delicate hair-like fringe, and become the organs by which the prawn advances in the water, and which are kept constantly in the same rapid motion that the natatory legs were kept in whilst the animal was in its larva state. The animal henceforth also ceases to move backwards, excepting for the purpose of avoiding danger.

Captain Du Cane also describes the changes in the larva of the common Shrimp, its general character being the same as the larva of the prawn, except that it has in this stage only three pairs of natatory legs; and its movements, instead of being retrogade, like the larva of the prawn, are constantly rotatory, excepting when they come in contact with each other: when they dart suddenly off in a lateral direction: the rudiments of the true legs were visible, but too minute to be enumerated.

The above particulars follow up the progressive changes of the prawn, and confirm the valuable observations of Mr. Thompson as to the fact of the macrourous decapods being subject to metamorphosis.

Captain Du Cane has repeated and confirmed his observations with other larva, two of which he watched in the act of shaking off their first envelop. "The abdominal section was cast in one piece, the cephalothorax in a second, and the animals were struggling to divest themselves of their antennæ and legs. I looked at this interesting operation for a considerable time, and even made some attempts to assist them in their endeavours; but they appeared to be exhausted by their struggles; and in fact in the following morning I found them dead." Captain Du Cane has also made some observations on the Opossum Shrimp; but he has rarely found one with a pouch.—*Abridged from the Annals of Natural History.*

THE SALAMANDER.

M. Paravey has communicated to the French Academy of Sciences, that a fossil Salamander, in the collection of Professor Van Breda, at Leyden, about three feet long, contains in the part corresponding with the abdomen, the fragments of frogs, eels, &c. thereby affording a proof that antediluvian species fed upon the same substance as the salamanders

of our times. A large salamander brought by M. Siébold, from Japan, still lives in the museum at Leyden, and is principally fed on frogs. The above-mentioned traveller brought the male and female into Europe, but the latter was devoured by the former, after he had been for some time without food. This salamander is described in the Japanese Encyclopædia, in which work M. Paravey finds the same fables which exist in Europe concerning the insensibility of the animal to fire. The same stories concerning the chameleon are also found in this Encyclopædia, and bring further conviction to M. Paravey, that a very ancient centre of civilization has existed, whence come the ideas concerning art and science, which have been transmitted to us by the Greeks and Romans, and are so to be found in Chinese books.—*Athenæum.*

NERVOUS CURRENTS IN THE CHAMELEON.

Dr. Weissenborn, in an interesting inquiry into the phenomena of the chameleon, states that he has several times felt what he thinks was a slight electrical shock, when touching a chameleon in his possession with the forefinger and thumb applied to the opposite halves of the animal. The Doctor adds: " I think it not unlikely that the nervous currents may *directly* cooperate in effecting the changes of colour in the chameleon, or such tissues of other animals as are subject to discolouration from various affections. The experiments of M. Matteucci shew that such changes may be effected by the animal electricity, on the accession of certain chemical substances; and we need only suppose that such substances are mixed with the juices of the chameleon, (one of them, oxygen, certainly is so,) and that these juices are instrumental in completing the electrical circle, in order to account more fully for the phenomenon in question.

" My own observations on these changes all tend to prove that they depend altogether on the degree in which the nervous system is stimulated or inactive. The principle is called into operation by more remote causes, as heat, light, and mental affections; and is instrumental in creating other and more immediate causes, as by causing the cutaneous tissues to become filled with gaseous fluids and liquids, or by affecting the possible chemical actions and reactions which may take place in various ways, under the influence of the nervous currents, according to their intensity or quantity."—*Mag. Nat. Hist.*

SLENDER-TONGUED SAURIANS.

Mr. Gray considers the British Museum collection of these animals to be one of the richest in novelties that he has ever examined; and, as it is daily receiving additions, he hopes that it will become one of the most extensive in Europe.

EXTRAORDINARY REPTILE OF SOUTH AFRICA.

Dr. Smith, in his *Illustrations of the Zoology of South Africa,* describes the *Varanus albogularis*, Daud, which is from four to five feet in length, and occurs but rarely within the limits of the Cape Colony. It is usually discovered in rocky precipices, or in low stony hills, and when surprised seeks concealment in the chinks of the former, or the irregular cavities of the latter; and when any irregularities exist upon the surface of the rocks or stones, it clasps them so firmly with its toes, that it is very difficult to dislodge it, even though it can be easily reached. Under such circumstances, the strength of no one man is able to withdraw a

full grown individual; and two persons are sometimes required to pull a specimen out of a position it has attained, even with the assistance of a rope fixed in front of its hinder legs. The moment it is dislodged it flies with fury at its enemies, who by flight only save themselves from being bitten. On being killed, it is often discovered that the points of all the nails have been broken previously, or at the moment it lost its hold. It feeds upon frogs, crabs, and small quadrupeds.

NEW ANOMALOUS REPTILE.

Mr. John Natterer, the industrious collector, who has lately returned to Vienna from South America, has described in the *Annals of the Vienna Museum*, (ii. p. 167,) under the head of *Lepidosiren paradoxa*, a new anomalous reptile, which has much the appearance of an eel, but is covered with large netted scales, and the body is furnished with four simple elongated tapering legs; the front pair being placed on the back edge of the upper part of the spiracles, and the hinder pair on the under side of the hinder part of the body. The jaws are furnished with strong truncated teeth, and the vent, which is circular and plaited, is placed on the left of the centre of the under side of the body, just behind the base of the left hind leg. It was discovered in the Brazils, near the river Amazon, and grows to three feet in length. They had two specimens in the Vienna Museum: one of which has been submitted to Professor Th. Bischoff for dissection.—*Annals of Nat. Hist.*

ECONOMY OF THE BOA.

On September 17, Dr. Robertson presented to the Institute, at Paris, the following new observations on the Respiration and Deglutition of the Boa-Constrictors, now exhibiting in Paris. These enormous serpents swallow several large live fowls, one after the other, at a meal. During the repast, which lasts half an hour or more, the throat continues greatly distended, and all communication between the nostrils, (through which the reptile usually breathes,) and the lungs is completely shut out; but, by an admirable provision of nature, the creature protrudes the orifice of its windpipe, from between the branches of the lower jaw, quite out of its mouth, to the extent of an inch, and at least three inches beyond its usual situation. The throat being distended to its utmost stretch by the fowl or rabbit in the œsophagus, the glottis is seen protruding between the branches of the lower jaw and the skin of the throat; and the protrusion is greater in proportion as the object in the act of being swallowed is of a large size. Every half-minute, more or less, the orifice of the windpipe is opened to nearly half an inch in diameter, and a gush of air, like that from a small pair of bellows, issues out; when, fresh air being immediately afterwards taken in, the glottis is again closed by the sphincter muscles till the next expiration, and so on alternately.—*Times.*

THE INDIAN JUGGLERS' SECRET.

Lieutenant Hutton states, that the snakes which the Indian jugglers handle with impunity are drugged with opium, which renders them quiet and harmless. The effects of the drug will not wear off for a fortnight or three weeks: a drugged snake which Lieutenant Hutton purchased, at the lapse of three weeks, flew at him unexpectedly, and nearly strangled him.—*Oriental Herald.*

LARGE CENTIPEDE.

ON October 8, a centipede, nine inches in length, was found in splitting a log of teak-wood, in the dock-yard at Woolwich: it was in a very lively condition at the moment of its emancipation from the wood.—*Times.*

LONGEVITY OF A FROG.

A LIVE frog has been found near Kilmarnock, at the depth of 120 feet, and fairly embedded in coal, in a nest the shape of its own body. The animal was quite lively, and having shaken off some of its black, appeared of nearly the usual colour. Its legs were long in proportion to the body. From all appearances, it must have lain dormant for several centuries.—*Literary Gazette.*

NEW BRITISH ZOOPHYTE.

MISS ATTERSOLL has lately discovered, on the coast of Sussex, the *Cornularia rugosa* of Cavolini, growing on a *Tubularia*, and has sent specimens of the same to the British Museum. This genus has hitherto been believed to be confined to the Mediterranean. It differs from most other thorny Zoophytes in the tentacles being pinnate like those of *Gorgonia.*—*J. E. Gray; An. Nat. Hist.*

CAUSE OF THE RED COLOUR OF AGATES.

M. TURPIN considers the red colour of agates to be owing to a number, greater or smaller, of *Protococcus kermesinus* accumulated together, or more frequently reduced to their small red globules, (seminules,) agglomerated or coagulated, and distributed, according to circumstances, in the colourless structure of these siliceous compounds. Microscopic and comparative investigations have convinced M. Turpin that the various colours, rose, orange, blood-red, and reddish-brown, (varieties owing to more advanced growth,) which are inclosed in, or which surround, the translucid and colourless structures of different kinds of agates, are found to be owing to the presence either of red globules uniformly mixed, as in the carnelian; or agglomerated into small irregular dots, and distributed into circular waves, according to certain forms or conditions which existed at the time of the siliceous conglomeration; or finally, though more rarely, to these small red vegetables themselves, quite entire and distinctly visible with the microscope. It is impossible to find a resemblance in colour and polish more striking than that which is seen in a white glass phial filled with *Protococcus kermesinus,* when compared with a carnelian, as may be fully established by the trial.—*Jameson's Journal.*

STINGING POWER OF MEDUSÆ

PROFESSOR EHRENBERG observes: it appears that the belief of the stinging or burning power of the *Medusæ aurita* is founded on a confusion of species. In the East or Baltic sea, where this species alone is found, I have often, while bathing, brought my body in contact with the animal without receiving any injury: even touching it with the tongue caused no feeling of sharpness. On the contrary, I have suffered much in the North Sea, from violent burning and swelling of the back of the hands, caused by the red *Cyanea* (*Medusæ*) *capillata.* In the North Sea, therefore, bathers ought, as in the Mediterranean and the Atlantic, to avoid contact with the medusæ; while, on the south coast of the Baltic, they

have nothing to dread from these exquisitely beautiful *Medusæ auritæ.* On the northern coast of the Baltic, injurious medusæ are frequently to be met with after storms; though they speedily die, as they require salter water.—*Jameson's Journal.*

HYDRÆ.

A. J. CORDA, in the November Art. Ph. Med. xviii. 229. t. 14—16, has given a very complete anatomy of the brown fresh-water polypus, (*Hydra fusca,*) shewing that the animal is of a much more complex organization than was previously supposed, and that the digestive cavity is furnished with a short straight canal, ending with a distinct vent in the hinder part of the body, near the foot or part by which it adheres.—*Mr. J. E. Gray; An. Nat. Hist.*

ACTINIÆ.

MR. J. P. TEALE, of Leeds, has read to the British Association a paper on the Gemmiferous Bodies and Vermiform Filaments of *Actiniæ,* in which, after referring to the difference of opinion among zoologists on the reproductive organs of the *Actiniæ,* he proceeded to make some observations on certain filiform organs closely connected with them, and described the structure of the genus. The gemmiferous bodies are about 200 in number, and appear as elongated masses attached along the inner border of most of the leaflets. Each of them is composed of several horizontal folds or plates, and when carefully unfolded may, by the assistance of a lens, be seen to consist of two delicate layers of membranes enveloping one closely compacted layer of gemmules. After unfolding the gemmules, the membrane layers become placed in opposition, and form the mesenters, by which the gemmiferous body is attached to the leaflet. The vermiform filaments represent a delicate mesentry to the internal border of each gemmiferous body; it is a delicate vermiform thread minutely convoluted, forming an elongated mass extending from the superior to the inferior part of the gemmiferous body. The thread is of a milk-white colour, about the thickness of a horse's hair, and yields to a slight pressure with a needle. The filaments, during life, exhibit a distinct vermicular motion, even for some time after they are detached from the animal.

ANNELIDÆ.

M. MILNE EDWARDS has been employed on the coast of Bretagne, in following up his researches, thereby confirming his previous observations on *Annelidæ* and making others of equal value. It appears according to him, that *Annelidæ,* which have been hitherto designated as animals with red blood, so far from exhibiting this character constantly, frequently have it colourless, yellowish, and even of an intense green; from which he concludes, that in this class the colour of the blood is of too little physiological importance to form a zoological character. The circumstance of these variations in the physical properties of the blood of inferior animals, makes new experiments in its chemical composition highly desirable; for we are naturally led by them to ask, whether the red colour depends on a colouring matter, derived from iron, like the hematosine of the blood of mammalia, or if it arise from some other cause. The circulating apparatus of these animals has also occupied the attention of M. Edwards, and the first thing which struck him, was its

variety; a variety which is unknown in the higher classes, and which is to be met with in the genera belonging to the family; sometimes they have true hearts, sometimes contracted bulbs, at others a capillary network; and the functions of the same vessels vary so much, that it becomes difficult to apply the name of veins or arteries. There is however one certainty, which is, that there are always two systems of sanguinary canals; the one dorsal, the other ventral, and the principal modifications of both depend on their formation, either into two similar and symmetrical longitudinal vessels, or to a partial or entire consolidation into one median trunk. In the most perfect of the *Annelidæ* the blood circulates constantly and continuously, and according to M. Milne Edwards, in the dorsal system from behind to before, and in the ventral from before to behind. In the less perfect, the blood appears to oscillate rather than circulate.—*Athenæum.*

BORING MARINE ANIMALS.

On May 22, the Rev. F. W. Hope offered to the Zoological Society some observations on the ravages committed by the *Lymnoria terebrans* upon the piles of the pier at Southend, and exhibited a portion of the wood attacked by them. Deal wood is particularly attacked by this small crustaceous animal, which pierces the wood so that it crumbles, and the pieces are, by the abrasion of the water, carried out to sea. It has been usual to char the lower part of the pile, or encase it with copper; but this last is no protection, as the animal gets in between, and the piles shortly become useless. The pier at Brighton has been almost destroyed by them, as was that of Leith a few years since; and it is a matter of economy whether iron should not be substituted for wood, as the former might easily be protected by any kind of varnish or tar.

Mr. Gray has called the attention of the Zoological Society to some pieces of chalk which he had found in the cliffs at Brighton, exhibiting perforations made by the *Patella* and *Pholas*, and presenting appearances which he considered to have been produced in the case of the latter genus by the rotatory action of the valves.

A discussion ensued as to the manner in which certain molluscous genera penetrate limestone rocks and other hard substances, a phenomenon which Mr. Owen thought could not be explained upon the supposition of its being exclusively caused by a rotation of the valves, but that it was chiefly due to the mechanical influence of the currents of water produced by the vibratile *cilia* of the animal, as noticed by Mr. Garner, in a communication made to the Society in 1835.—*Proc. Zool. Soc.*

Dr. Moore has communicated to No. 16 of the *Magazine of Natural History* the occurrence of the *Teredo navalis* and *Lymnoria terebrans* in certain parts of Plymouth Harbour; although both these animals had been considered extinct. For example, a piece of elm has, in two years, been one-third destroyed by these animals.

NATURALIZATION OF DREISSENA POLYMORPHA.

Mr. Strickland has communicated to the *Magazine of Natural History* several interesting facts connected with the history of this mollusc, which, though recently introduced into this country, propagates so rapidly, that it will, probably become, in a few years, one of our com-

monest British shells. In all the cases cited by Mr. S. (save one), this shell has been found in navigable rivers, where its transport has, doubtless, been effected by means of timber; and the author considers it worth inquiring how far the original introduction of the shell might have been effected by natural causes alone, such as the drifting of a piece of timber with these shells attached, down one of the European rivers, and across the German Ocean, into some brackish or fresh-water estuary on our own coasts. Its first noticed occurrence here was in the Commercial Docks, Rotherhithe, whither it had probably been brought attached to Baltic timber. The geologist will see the importance of the inquiry, as connected with the distribution of organic remains, and the sudden appearance and disappearance of particular species in a given *stratum.*—*Magazine of Natural History; abridged.*

PHOSPHORESCENCE OF THE SEA.

By the researches made in the French ship *La Bonité*, in her recent voyage round the world, it appears that the phosphorescence of the sea is not inherent in the water, but essentially due to the presence of organized matter, and is owing to animals of different classes. According to M. Robart, this property of phosphorescence in the northern seas is occasioned by animal matter held in solution, and not by the presence of animalcules.—*Railway Magazine.*

STOMATA IN MOSSES.

Mr. W. Valentine, F.L.S., has communicated to the Linnæan Society, the discovery of stomata in mosses; an opinion of their absence from that family having universally obtained amongst botanists. It was in *Bryum crudum* that Mr. Valentine first detected stomata, and of 103 British mosses examined by him, seventy-eight were found to possess these organs. Their situation in this family is very remarkable; being confined, with one exception, to the theca, and the thinness of the tissue will readily account for their absence from other parts.

SPONGES; ANIMAL OR VEGETABLE?

On June 5, were read to the Linnæan Society some observations on the river sponge, (*Spongia fluviatilis*,) by Mr. Hogg. Much difference of opinion still exists among naturalists, respecting the place which the sponges ought to occupy; some referring them to the animal kingdom, while others contend for their vegetable nature. Mr. Hogg is inclined to adopt the latter opinion, which is also that of Dr. Johnston, of Berwick: one of the species exhibited by Mr. Hogg, had its cells filled with numerous small lenticular, seedlike bodies, which are its reproductive organs, and which were neither furnished with cilia, nor possessed of any locomotive property; both of which have been observed in those of the marine sponges. Another specimen of the same species was parasitical on *Hypnum riparium*, and a third was found on the larva case of a species of *Pzryganea*, a circumstance long since recorded by Pallas. —*Literary Gazette.*

Mr. Hogg has watched the development of the seedlike bodies; for having placed some of them in a glass vessel, replenished daily with fresh water, six of them soon became attached to the bottom of the vessel, and in about three weeks each of them was found covered with a whitish woolly substance, which he took for the commencement of sponge; but, unfortunately, their further progress was not observed.

To the discovery of dilatation and contraction in the vesicles of the *Spongillæ*, M. Dujardin has added another character in support of his theory of animality: it is, that they are furnished with excessively fine filaments, the undulations of which influence the movement of the water around them.

HABITS OF THE TRITONIA.

DR. GRANT has noticed this interesting Scottish mollusc to emit, at intervals, a very peculiar and audible sound which proceeds from the mouth of the animal; "and, at the instant of the stroke we observe the lips suddenly separate, as if to allow the water to rush into a small vacuum formed within. The sounds may possibly be a means of communication between these animals; or, if they be of an electric nature, they may be a means of defending from foreign enemies, one of the most delicate, defenceless, and beautiful gasteropods that inhabit the deep."

GIGANTIC ECHINUS SPINE.

THERE have lately been discovered in Sicily two fragments of a gigantic spine of an *Echinus*, nearly an inch and a half in circumference, and more than eight inches long.—*Mr. J. E. Gray; An. Nat. Hist.*

WHITE LIGHT FROM BURNING CORALLINES.

AN intelligent correspondent of the *Magazine of Natural History* states that a very beautiful white light is produced by holding pieces of *Corallina officinalis* close to the flame of a candle. "It appears," adds he, "to be a beautiful practical illustration of the hydro-oxygen light, the hydrogen being evolved by the candle, and the oxygen contained in the coral and the surrounding atmosphere, which being decomposed, gives out a sufficient quantity of each to unite in the proportions necessary to form this fine light."

NEW SPIDER.

MR. M'LEAY, in describing some new forms of *Arachnida*, notices a specimen of the genus Deinops, above all others interesting in the position of the eyes, which are remarkably unequal in size. Two of them are dorsal, as usual, but the other six have a rather novel situation, not being visible when we look on the back of the insect. The head, being truncated in front, presents, like that of certain saltigrade spiders, or rather like certain crustacea, a vertical face. Half of this face is occupied by two enormous black eyes, set in blood-red circular rims, which touch each other laterally, and form irides, that give our spider a most truculent aspect. The spider is found under stones in the island of Cuba.—*An. Nat. Hist.*

SPINNING OF SPIDERS.

ON June 5, Mr. Blackwell stated to the Linnæan Society, that all the spiders which have come under his notice, are provided with four, six, or eight spinning mammulæ, which are somewhat conical or cylindrical, and composed of one or more joints each; they are usually grouped in pairs. Exceedingly fine, moveable papillæ, or spinning tubes, for the most part dilated at the base, occur at the extremity of the mammulæ, or are disposed along the inferior surface of the terminal joint; whence issues the viscous secretion of which the silken lines produced by spiders are formed.—*An. Nat. Hist.*

MODERN CLASSIFICATION OF INSECTS.

THE Rev. Mr. Hope has read to the British Association, a communication, of which the following is an outline:—1st. That modern entomologists, in their arrangements, have attended almost entirely to external organization. 2ndly. Internal organization has only been partially attended to: the alimentary canal, on which much stress is placed, cannot be considered as a criterion of an animal or a vegetable feeder, and is ill adapted for the classification of insects. 3rdly. No uniform principle of arrangement has been entirely carried out: all have been interfered with by the introduction of other principles of a secondary and minor importance. 4thly. It is only from increased attention to the *Nervous System* that we can expect a more natural system than what exists at present.

Mr. Hope added, in the class Insecta, great progress was making, and by the labours of such men as Müller, Ehrenberg, Grant, and Neuport, the latter of whom he might call the Lyonnet of England, they were making rapid strides towards establishing a classification of insects on a knowledge of their nervous structure.—*Abridged from the Athenæum.*

NOXIOUS INSECTS IN 1838.

THE Rev. Mr. Hope has read to the British Association, a paper "On Noxious Insects occurring in the year 1838, more particularly the *Tipula tritici*, of Kirby."

The author commenced his obseservations on the *apple blight.* In this year, apple-trees have chiefly suffered from the attacks of two insects; one is a beetle, (*Anthonomus pomomus,*) which attacks the blossoms in bud, and prevents the fruit from what is called "setting." The second is the *Aphis*, or plant-louse, which is this year exceedingly abundant. The apple, the hop, and the wheat, have suffered from it. When vegetation in spring has made considerable advances, and the weather becomes wet and ungenial, then Aphides appear in greatest abundance. He attributes the great abundance of Aphides this year to the cold. In 1829, the Aphides were succeeded by the Coccinelidæ: is this usual? The Aphides on the wheat this year are more abundant on the spring than the autumn-sown wheat, and (near Cheltenham) more numerous on bearded wheat. *Tipula tritici* is observed to be abundant in some districts. The pupa and the chrysalides are not so numerous as in former years, but the caterpillars are very abundant; and the wheat appears more damaged by Aphides than Tipulæ. The author then hoped botanists would supply information: — 1. On the species and varieties of wheat grown in this country; 2. Diseases of wheat arising from parasitic fungi and other causes; 3. The provincial and local names of the kinds of wheat.

Dr. Greville remarked, that many Aphides which were abundant last year were scarce this, and *vice versâ.* Sir C. Monk had observed the attacks of certain insects to be periodical, and detailed some facts in illustration. A member observed, that the rate of growth of a plant affected its liability to the attacks of insects. If it grew fast, the insects could no longer remain on the point of the plant, and thus were prevented doing much injury. Mr. Richard Taylor confirmed this opinion.—*Abridged from the Athenæum.*

TURNIP INSECT.

On Nov. 5, the prize of ten guineas given jointly by the Entomological Society, and the Saffron Walden Agricultural Association, was awarded to Mr. Neuport for his Essay on the *Athalia Centifolia*, the insect that has for some years past been so destructive to the turnip crops of this country.

PARASITIC INSECTS.

On June 5, Mr. Thwaites presented to the Entomological Society a specimen of *Stylops Dalii*, a remarkable insect parasitic in the bodies of living bees, and of which he had taken a number of specimens under the wing. Mr. Westwood exhibited a series of drawings illustrative of the natural history of the *Nematus gallicola*, and *Balaninus salicivorus*, and of a beautiful undescribed insect, *Eulophus nemati*, parasitic upon the former insect. The Rev. Mr. Hope made some observations upon a case which had recently occurred in Lincolnshire, in which a brood of the common house-clock had been dislodged from a tumour in the jaw of an aged and crippled individual.

INSECTAL AND VEGETABLE PARASITISM.

On April 2, were read to the Entomological Society, notes from Dr. Buckland and the Rev. M. E. Berkeley, on the vegetable nature of various excrescences occasionally observed upon insects; the disease to which the house-fly is subject in the autumn, being, according to Mr. Berkeley, caused by the presence of a minute fungus, and not being a plethoric kind of disease as supposed by some writers. The Secretary communicated various observations recently made upon this subject, and upon the analogous parasititism of insects on the bodies of insects; stating the occurrence of one of the Strepsiptera in *Ammophila sabulosa*, one of the sand wasps. A large larva of one of the Lamellicorn beetles, was also exhibited, from the collection of the Rev. Mr. Hope, from which a fungus nearly two inches long had been produced.

On July 2, the Rev. Mr. Hope exhibited to the Entomological Society several instances of these phenomena. From one of them, a species of the South American genus *Acanthocephalus*, numerous very long and slender filaments, much longer than the entire insect, and beautifully feathered, had vegetated, and which, probably, belonged to the genus *Trichia*. In another specimen, one of the large Brazilian *Curculionidæ*, a dipterous larva had protruded itself between the front of the thorax and head. Mr. Westwood noticed a remarkable modification in the habits of the caterpillars of a small moth, which, at first, burrows in the leaves of the common lilac, but after it has attained sufficient strength, it rolls back the leaves, fastening them in a curl, with silken thread.—*Athenæum.*

THE ZUSSEH SILKWORM OF INDIA.

On June 9, Dr. Geddes read to the Asiatic Society a paper on the Zusseh Silkworm, the moth of which he considers to be the *Saturnia Paphia.* The Doctor twice caught the moth while depositing her egg; once in December, 1826, and again in November, 1830. The eggs deposited after that were, in each case, above 200; they were in small heaps, adhering together, and generally hatched in little more than ten days. The interval between hatching and spinning was very different in different worms from the same moth, being, in some cases, as little as

thirty-six days, and in others reaching to fifty-four. They change their skins in this interval four times, and the colour of the insect varies at each change. At the full size, when it attains the length of four inches, its colours are very brilliant; its head is light brown, its body green, with rows of spots, orange, red, and blue. Dr. Geddes fed them upon the leaves of the Ber tree, (*Zizyphus jujubus*,) but he also has seen them on the Ahseen, (*Terminalia alatra glabra*,) on which the insect is chiefly fed in the open air, in the Nagpore territories. The natives place them on a tree when hatched, and, as soon as the leaves are devoured, they chop off all the branches, and remove them, insects and all, to another tree. When ready to spin, the insect first forms a ligature of an inch thick, which it fastens to a twig, and at the extremity, it spins its cocoon, which sometimes reaches the size of a pigeon's egg. The time of their remaining in this state varies much in different individuals; and moths have been found living at all periods, from the 5th of November to the 20th of June. Dr. Geddes was unable to procure any fertile eggs from the moth which he had; but he stated that the difficulty was got over by Dr. Helfer keeping the moths under a musquito curtain. Much care is necessary to protect the insects, in all stages of their existence, from rats, ants, and other enemies.

EDIBLE CHRYSALIDES OF SILKWORMS.

A LETTER from M. Favand, a missionary in China, states that during his long residence in that country, he has often seen the chrysalis of silkworms used as food. He has himself partaken of them, and found them at once strengthening and cooling. After having wound the silk off the cocoons, they are dried in the frying-pan, when the envelop will come off, and they appear like little yellow masses resembling the eggs of carp. They are fried in butter, lard, or oil, and moistened with broth. When they have been boiled in this for five minutes, they are stirred well, and crushed with a wooden spoon. The mandarins and rich people add the yolk of eggs, in the proportion of one yolk to 100 chrysalides. The poorer people are contented with salt, pepper, and vinegar, or, after stripping them, cooking them with oil.—*Athenæum.*

THE SAWYER BEETLE.

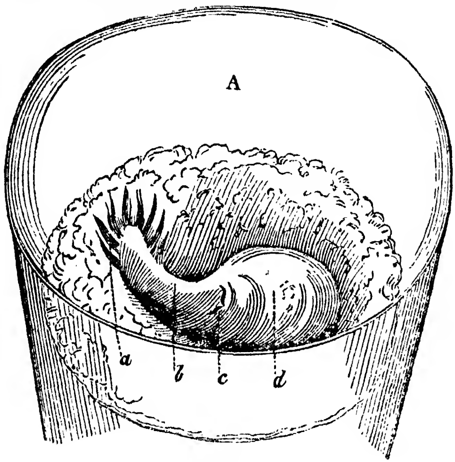
THE Rev. Mr. George Wailes has submitted to the British Association a specimen of the rare *Psalidognatthus Friendii*, (the beetle opena,) which was found some years ago in the river Magdalena, near Bogota de Sante Fé. The Rev. Mr. Hope directed attention to the armature of the thorax of the insect. Another specimen was afterwards produced and found to be of a different sex from that exhibited by Mr. Wailes, the difference in the sexes being so great, that naturalists who had not seen the two, placed them in different genera. The movements of the Sawyer Beetle, were asserted to be circular by Mr. Hewitson, who has in his possession specimens of this insect. He said that they injured apple-trees in this manner.

ERRORS RESPECTING THE ANT-LION.

MR. J. O. WESTWOOD, F.L.S. has communicated to the *Magazine of Natural History* some interesting notes on the habits of the Ant-Lion, *Myrmelium formicarium*, Linn.) Having brought three living specimens from Paris, one almost immediately afterwards enclosed itself in a globular cocoon of fine sand; but the other two afforded Mr. Westwood

many opportunities of watching their proceedings, and thus correcting some mis-statements respecting the habits of these curious creatures. They were observed to walk backwards, an anomalous circumstance not often met with in animals furnished with well-developed legs. It generally works in a spiral direction backwards and downwards at the same time; jerking the sand about on each side and backwards, but never forwards, as misrepresented in some figures. Again, the account given in popular works of the instinct by which the ant-lion throws the sand exactly in the direction of the escaping prey, is not quite correct; the act of throwing up the sand when an insect has fallen into the pit and attempts to escape, having evidently for its chief object, that of making the pit deeper and more conical, and, therefore, more difficult of ascent.

On placing it on a flat surface, it first thrusts the extremity of its body to a short distance in the sand, and then by the assistance of its hind pair of legs drags itself backwards, its four fore-legs being extended



(The Ant-lion at work.)

and trailing after it immoveably. In the figure, A represents a glass containing sand; *a*, traces on the surface of the sand left by the fore-legs and jaws; *b*, is the downward track of the larva, gradually deepening; *c* the jaws of the larva exposed; and *d*, a little hillock of sand raised by the body of the ant-lion underneath. At this period of the formation of its burrow, the insect is engaged in throwing back the sand.

By watching the motions of the larva whilst on the surface of the sand, and before it had immersed itself, Mr. Westwood perceived it to be by the retrograde motion of the hind pair of legs, which are directed backwards, that the insect effects its motions. Moreover, when digging vigorously, the creature makes a short step backwards, by which means a portion of the sand is thrown on the head: owing to the hump-like form of the back this is immediately jerked away, the body at the same time advancing another step in its backward and spiral motion.—(*Abridged.*)

MR. CROSSE'S ACARUS.

M. TURPIN has reported to the French Academy of Sciences that a solitary specimen of the acarus of Mr. Crosse, preserved in spirits of wine, and enclosed in a small phial, presented, on examination, the following characters :—

In the phial, it appeared merely as a whitish speck ; its specific gravity causing it to remain at the bottom of the vessel.

It was then taken out of the alcohol, dried, and placed between two plates of glass, with a thin layer of varnish, and placed under a microscope, with a power of magnifying the diameter 280 times. Thus seen, the body was of an oval form, the stomach slightly flattened, and the back very much arched. The dorsal surface was studded with a profusion of small pupillæ, a certain number of which, larger than the rest, and distributed here and there among them, served as bases or bulbs to some long hairs or bristles, which pointed in every direction, and were mostly as long as the body of the animal, giving it the appearance of a microscopic porcupine; its resemblance to that animal being still further heightened by the lengthened snout.

Viewed as a transparent object, there were not discovered any traces of a stomach, ovary, or, lateral pulmonary lobes. The situation of the anus was faintly indicated by a slight indentation situated in the direction of the median line, and at the posterior part of the abdomen. There was, however, seen very clearly a large oval egg, like those which are perceived, often to the number of two, three, or even four, in the transparent body of the female domestic *Acarus*, both of cheese and flour, and in those of the same sex in the *Acarus* of the human body. The egg, similar in shape at both ends, and one-seventh of a millimetre in length, happened, rather singularly, to occur in the solitary individual sent by Mr. Crosse ; "as if chance were willing to furnish us with a material proof of the well-known mode of re-production of the *Acari*, in the very species which had been supposed to be producible at will, merely by the aid of elementary molecules floating in space."

From the anterior part of the body projects a sort of head terminating in a lengthened snout ; in which could be perceived an upper lip, notched at its extremity, beneath which a dagger-shaped rostrum projected ; and under this, but situated laterally, were found two large moveable mandibles, which were pointed, and slightly bent inwards. Within these, and pointing in the same direction, were two palpi, shorter than the mandibles, and nearly hidden by them, and the lip which protected them.

In this specimen it was not possible to establish the existence of a lower lip, which is so large and evident in the *Acarus* infesting the human body. Neither were discernible the two small smooth eyes, situated on the neck of the other species of this genus.

On the circumference of a kind of sternum are placed eight limbs, all locomotive and articulated ; the four anterior directed towards the front, and the four posterior towards the hinder part. They are all composed of the same number of pieces ; but, as may be remarked in many insects, and in the *Arachnida* and *Crustacea*, the two anterior pairs of limbs are shorter, thicker, and more robust than the hinder ones. This difference, though hardly observable in the *Acari* of cheese and flour, is very great in the *Acarus* of the human body.

Each of the eight legs is formed of seven joints, of unequal lengths ; the first, or hip, being triangular, and the seventh terminated by a little transparent tarsus, apparently bi-lobate, and provided with a single claw,

bent inwards. Upon the upper edge of each of these joints, except that which forms the hip, are one or two straight and stiff hairs.

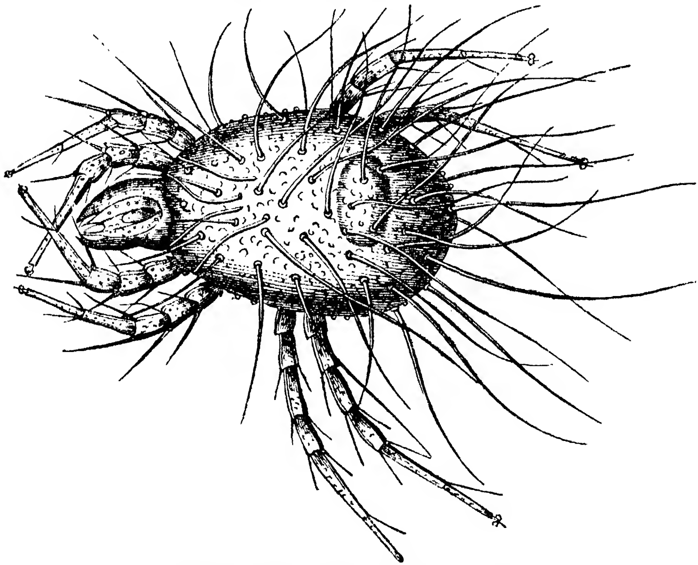
The actual length of the body and head is half a millimetre.

The *Acarus* of Mr. Crosse appears to constitute a new species of that genus; nearly approaching the *Acari* found in cheese and flour; or, perhaps, more nearly Hermann's *Acarus dimidiatus.*

M. Turpin proposes for this species, supposing it not to have been previously described, and to retain its novel mode of originating, the name of the Rough Acarus, (*Acarus Horridus.*)

Having given the zoological details of this little animal, M. Turpin observes that, although microscopic, it is scarcely possible for its organization to have been more complex. Its parts consist of, first, a body; secondly, a head, formed of two lips, two mandibles, two feelers, a rostrum, a mouth, and two eyes; thirdly, a stomach and anus; fourthly, two lateral pulmonary lobes; fifthly, an ovary, containing eggs in the female specimens; sixthly, eight limbs, each composed of eight joints, including the tarsus; seventhly, a skin, bristled with numerous long hairs. There are besides distinct species, and the females form and deposit eggs, whence proceed individuals, at first provided with only six legs, until the period when, shedding their skins, two more appear, which were in progress of development under this cutaneous slough.

M. Turpin then proceeds to treat the subject of the production of Mr. Crosse's *Acarus,* as well observed by the editor of the *Magazine of Natural History,* not in the most philosophical manner, terming it "the pretended origin of the microscopic spider," "not worth the trouble it has



(The Crosse Mite; *Acarus horridus,* Turpin.)

occasioned." At the outset, his decrying the subject as "very far beneath the important and definite labours in which the Academy is usually occupied" did not lead us to expect candour from the French philosopher; so that we are especially struck with his confession of his ignorance of the details of the experiment as already published by Mr. Crosse, whose conduct throughout has been irreproachable.—*Translated in Mag. Nat. Hist. from the Comptes Rendus; abridged.*

BOTANY.

EARTHY BASES OF VEGETABLE TISSUES.

ON March 8, a paper was read to the Royal Society, proposing "A New Theory of Earthy Bases of Vegetable Tissues," by the Rev. J. B. Reade. In opposition to some of the views of M. Raspail, the author finds that in the bark of the bamboo and the epidermis of straw, the silica incrusting these tissues is not crystalized; but, on the contrary, exhibits, both before and after incineration, the most beautiful and elaborate organization, consisting of an arranged series of cells and tubes, and differing in its character in different species of the same tribe, and in different parts of the same plant. Mr. Reade likewise states, in confirmation of Dr. Golding Bird's views, that, by employing caustic potash, the siliceous columns may be removed from the leaf of a stalk of wheat, while the spiral vessels and ducts, which form the principal ribs of the leaf, as well as the apparently metallic cups which are arranged on its surface, remain undisturbed. He proposes, therefore, to substitute, in the description of vegetable tissues, the term *skeleton*, instead of *bases*, whether saline or siliceous, of those tissues.

COPPER IN PLANTS.

PROFESSOR SPRENGEL, of Brunswick, has found in the cinders of *Trifolium pratense*, three per cent. of copper, and the same quantity of this metal in those of *Trifolium pannonicum*, cultivated in his garden, the soil of which is very different from that whence the *Trifolium pratense* had been obtained. M. Sprengel subsequently examined some trefoils grown in a field, the soil of which did not indicate any traces of this metal in its composition; and was convinced that its existence in the two former was owing to its presence in the ground where the plants were cultivated. This fact proves that a small quantity of a noxious substance may be absorbed by plants without any prejudice to their development.—*An. Nat. Hist.*

SALINE COMBINATIONS IN VEGETATION.

DR. GOLDING BIRD has communicated to the *Magazine of Natural History*, some "Observations on the existence of Saline combinations, in an organized state, in vegetable structures;" from a consideration of which, "it is evident that the saline matters existing in vegetable tissues of plants have been too much neglected, seeing that the part they play in the economy of vegetable life is as important as that of any other constituents; and that we have been far too hasty in declaring their presence adventitious and accidental. And, have we not sufficient grounds to justify our considering that those botanists, however high their names

may rank in the records of science. have been in error in assuming that all principles, except carbon, hydrogen, nitrogen, and oxygen, are foreign to vegetable structure?"

ACTION OF CARBONIC ACID ON PLANTS.

Dr. Schleiden, of Berlin, has published in Wiegmann's *Archiv*, some observations on the luxuriant development of various plants in water containing carbonic acid. The springs in the valley of Göttingen are very rich in free carbonic acid, especially the basins near the Wehnder paper-mill, and here is found a rich and luxuriant vegetation, which in spring appears several entire weeks earlier, and continues in autumn much later, than at other spots of the same district. Dr. Schleiden thinks that the free carbonic acid in the water exercises a favourable influence on the vegetation, which certainly may be the case; for observations have shewn that by the vegetation of plants in solar light, the addition of a very small quantity of carbonic acid in the surrounding atmosphere produces a much more powerful disengagement of oxygen than takes place in the common atmosphere.—*Meyen's Report; An. Nat. Hist.*

SPERMATIC ANIMALCULES IN PLANTS.

Some years ago, Professor Unger announced his discovery of animalcules of the genus *Vibrio*, in what are called the anthers of a moss, belonging to the genus *Sphagnum*. Recently, M. Meyen, Professor of Vegetable Anatomy at Berlin, has met with the same phenomenon in the so-called anthers of *Chara*, *Marchantia polymorpha*, and *Hypnum argenteum*. At the meeting of the Institute, when these facts were mentioned, Baron Humboldt, who was present, stated, that he and M. Müller, the Professor of Anatomy at Berlin, had witnessed the phenomena described by Professor Meyen, and that the movements of the animalcules appeared to them analogous to those of many infusoria.—*Athenæum.*

PLANTS USED IN FOOD AND MEDICINE.

On December 12, Professor C. Johnson delivered to the Medico-Botanical Society a lecture on the particular distinctions of the plants used in food and medicine. He first traced the several analogies between the animal and vegetable world, particularly describing the sap, on which a great deal of the property of the plant depended. Could we have a proper analogy in the resemblance of plants, we should possess all that we required for a proper division into natural families. Although, however, plants may agree in all essential particulars, there may be a striking difference on one point, and upon which a great variation of qualities depends. He next entered into a consideration of the different classes of plants forming food for man, pointing out the exception to the several classes. Notwithstanding accident first directed attention to the cultivation of culinary vegetables, very few of these are now found in a natural state, and they are then so modified as to escape the notice of any except expert botanists. The lecturer gave it as his opinion that it might almost be taken as a general rule, that in proportion as cultivation improved the nutrition of the plant for food, so did it deteriorate its medical qualities. It is remarkable that a very large proportion of plants employed as food are not now known in a wild state, particularly the different varieties of corn which have followed man in his emigrations, and are only met with under the hands of the cultivator.—*Times.*

MILK.

M. TURPIN asserts the startling fact, that he has seen milk, which is considered as an animal substance, turn into a vegetable. He compares the globules of which milk is composed to the bulbs in which hair is generated; and he has seen them developed in the same manner, so as to form the *Penicillium glaucum.* He recapitulates the facts announced in his memoir in the following manner:—1st. That in order to form the globules of milk, organic matter is organized, and becomes globular and vesicular in the cavities of the tissue, under the influence of animal life; 2nd. That the vesicular globules of milk, notwithstanding the place of its origin, are only endowed with vegetable life, and, like the seminules of Confervæ and other analogous plants, they are composed of two globules, one contained within the other; that which is internal secreting the butyraceous oil, and at the same time producing numerous internal globules; 3rd. That in this state the globule is only the germ of the *Penicillium glaucum;* 4th. That the *Penicillium* primitively and immediately produced by the globule of milk, afterwards enjoys the faculty of reproduction; 5th. That the globules of milk, when stopped and accumulated in the lacteal vessels, have the power of germinating there, and pushing forth long stems, and thus, by obstruction, cause swellings and disease; 6th. That the fibrous vegetation of the milky globule strongly resembles that of bulbous plants, as well as that of the Confervæ; 7th. That all the globules, whether of organic matter, or of this same matter in a state of organization, are so many germs ready to absorb, to assimilate, to extend, or transform themselves in very restricted and previously determined limits, each time that suitable stimulants and nourishment are offered to them; 8th. That there is nothing like proof that any invisible germs of the *Penicillium* can have fallen into these globules by any accident whatever.—*Athenæum.*

PERFUME OF FLOWERS.

ACCORDING to the experiments of MM. Schübler and Kohler of Tubingen, white flowers are the most numerous in creation, and the most odoriferous; and to these succeed the red flowers.

RESPIRATION OF PLANTS.

M. COLIN has lately read before the French Academy of Sciences a memoir on the Respiration of Plants, with experiments, proving that during the process water is decomposed, and that the carbonic acid formed is derived from the oxygen of the water, which unites with the carbon of the grain. It is proposed to examine, on a future occasion, whether the carbonic acid thus formed is totally or partially disengaged, and whether the hydrogen of the water is absorbed by the grain.—*L'Institut; Philosophical Magazine.*

PRESERVATION OF SPECIMENS.

ON April 12, Professor Christison read to the Botanical Society of Edinburgh some observations on the preservation of fruits and other botanical specimens in the moist state, remarking that he had found no fluid preserve the consistence and colour of fruits, leaves, and flowers, so well as a concentrated solution of common salt. Numerous specimens were exhibited which had been thus preserved for one, two, three, and five years, among which were sprigs with leaves, and ripe and unripe fruit; in the greater part of which the green tint of the leaves and the

peculiar colour of the fruit had undergone little alteration. When the fruit, however, is very pulpy, as in *Solanum Lycopersicum*, or lemons and oranges, a solution of salt is comparatively inapplicable, because the fruit shrivels by exosmosis of its fluids; and diluted pyroligneous acid is found to be preferable.—*An. Nat. Hist.*

BOTANICAL SOCIETY OF LONDON.

THE second anniversary meeting of this Society was held on Nov. 27, (it being the anniversary of the birth of the celebrated English botanist John Ray), Mr. J. E. Gray, F.R.S., President, in the chair. The Secretary read the report of the council, from which it appeared that the number of members elected since last year amounted to forty-eight, the total number then being ninety-eight, including most of the distinguished country botanists in England and Wales. The report of the Curator with respect to the the number of plants received for the herbarium was, of British plants, ninety-eight natural orders, 422 genera, and 1,050 species, including 18,592 specimens, from which the collection of the Society had been enriched, and the remaining number would be shortly distributed to those members desirous of completing their herbaria. The number of foreign plants amounted to 10,000 specimens. An address was then delivered to the members by the President, congratulating them upon the rapid progress the Society had made since last year, and upon the advantages it held out to those pursuing the study of plants by the interchange of specimens, &c.—*Times.*

TIMBER OF NEW ZEALAND.

THE most important among the timbers of these islands is the *Dammara*, (Coniferæ,) inhabiting dark forests, as well on the coasts as remote from the sea-shore, where it grows from fifty to one hundred feet high; the trunk varying from six to twelve feet in diameter. The timber is of excellent quality, close-grained, and durable, in house carpentry, as well as in plank or spar for naval uses. As yards and topmasts for ships, it has been found, by repeated trials, superior to all others for strength and flexibility. The tree yields abundance of a white and amber-coloured resin.—*An. Nat. Hist.*

BOTANY OF THE CHANNEL ISLANDS.

IN a communication to the British Association, Mr. Babington has given a list of those plants which are natives of the islands of Guernsey and Jersey. The total number of them is about 760, twenty of which have never been gathered in England; and Mr. Babington announced his intention of publishing an outline of this flora. This work is desirable, as it will form a link between the botany of Great Britain and that of the Continent of Europe.

FUNGI OF INDIA.

IN General Hardwicke's drawings, now in the collection of the British Museum, there is a book containing figures of a considerable number of Indian *Fungi*. It is curious to observe, that with only one or two exceptions, such as the germs *Podaxon* of Fries, they all very much resemble the European species, and belong to European forms.—*Mr. J. E. Gray; An. Nat. Hist.*

NEW BLACK INK.

M. Cannet declares that he has obtained a very beautiful black ink, of easy preparation, from the flowers of the Iris.—*Athenæum.*

VANILLA IN EUROPE.

Professor Morren, of Liege, has so far succeeded in cultivating vanilla in Europe, as to promise a very valuable addition to commerce. The plant he has raised is the *Vanilla planifolia;* and from two specimens, particularly, he has obtained many hundred fruits, as large and as aromatic as the best in Asia.

CAOUTCHOUC, OR INDIAN RUBBER.

On May 26, Professor Royle read to the Asiatic Society, a paper on Caoutchouc, the indestructibility and elasticity of which substance renders it useful for a variety of purposes—as for making cloths water proof; for varnishes and paints; also for elastic web, articles of clothing, surgical bandages, robe, bands for machinery, &c. Caoutchouc was known to the Peruvians, and to the Chinese in early times. Condamine first noticed it, in his voyage down the river Amazons, in 1743, by the name *Cachuchu.* Dr. Priestley afterwards mentioned it as a rubber-out of pencil marks. A few years ago, about five tons were imported: now 500 tons are annually brought into London and Liverpool alone; and the quantity is daily increasing.

Caoutchouc is produced by numerous trees and shrubs of the natural families of the *Euphorbiaceæ, Artocarpeæ, Apocyneæ, Asclepiadeæ,* and *Cinchonaceæ,* in tropical parts of the globe, where high temperature is combined with moisture. It is imported from Para, and other places in South America, Vera Cruz, Sierra Leone, Java, Penang, and Sincapore. It is also produced in India; and the present paper relates chiefly to its becoming an article of extensive import from that country. The Caoutchouc from Para is produced by *Siphonia elastica;* that of Penang by *Urceola elastica;* a species of fig yields that of Java, and is often made into torches used in searching for the edible birds' nests. On the Continent of India, it is most abundantly obtained from *Ficus elastica,* a native of the forests of Silhet and Lower Assam. This was described by Dr. Roxburgh nearly thirty years ago. About twenty years ago, a quantity of it was sent thence to Edinburgh; and from these specimens the best judges have ascertained that the Caoutchouc of *Ficus elastica* is of the most excellent quality. Dr. Royle feeling assured that this tree must be abundant, and knowing that it could be easily grown in every part of India, addressed letters on the subject to societies and individuals in Calcutta; the replies to which prove that the supply of Caoutchouc in the above-mentioned localities is inexhaustible.

In Assam are vast forests of Indian-rubber trees, of enormous size: one of these being described by Mr. Brownlow, who accompanied Lieut. Vetch, as measuring seventy-four feet round the inner cluster of trunks, 120 feet round the outer trunks, and 700 feet round the branches.

The substance Caoutchouc, (observes Mr. W. Griffith: *Journ. Asiatic Society,* of Bengal,) is a widely disseminated constituent of vegetable fluids. It has hitherto, (Mr. Griffith believes,) been found only in plants with milky juice, although its presence in all plants yielding such fluid remains to be proved. The presence of caoutchouc in silk has been attributed to the nature of the fluids of the plants on which the caterpillars

feed; but this, although applicable to the mulberry plants, can scarcely hold good with the various species of *Tretranthera* on which the Moonga feeds, or with the castor-oil plant, the chief food of the Eria, which in Assam does not appear to yield milk. Milky juice is often characteristic of certain families. but often not; its presence is frequently of importance, as it often affords valuable indications of affinity. It is remarkable that it is almost unknown in the grand division of Monocotyledonous plants. The families in which its presence may be said to be universal are *Apocyneæ*, *Asclepiadeæ*, *Campanulaceæ*, *Sobeliace*, and the great division of *Compositæ*, *Chicoraceæ*, of which the lettuce is a familiar example. It s of common occurrence in *Euphorbiaceæ* and *Tuliaceæ*, which orders may be looked on as the grand sources of caoutchouc. Thus, in addition to our Indian plants, the American caoutchouc is supposed to be produced by *Cecropia peltata*, which belongs to *Urticea;* and the ule tree of Papantla, from which the caoutchouc of that country is obtained, is supposed to belong to the same orders. Baron Humboldt, however, objects to the supposition of *Cecropia peltata* yielding the American caoutchouc, as its juice is difficult to inspissate.*

The order *Euphorbiacea* would likewise appear to supply a large quantity. Thus Dr. Lindley states that the true caoutchouc is furnished by *Siphonia elastica*, *Hevia quiancusis* of Aublet, a Surinam and Brazilian tree; and from a tree of this order a substance resembling caoutchouc is procured in Sierra Leone.

Some *Apocyneæ* are also reported to produce good caoutchouc; † thus *Urceola elastica* produces the caoutchouc of Sumatra, and it is from this plant that caoutchouc has been produced in Penang and exported to England.‡ *Willughbeia edulis* is likewise an Indian plant from which caoutchouc has been produced, but Roxburgh says it is of indifferent quality: unless the author has been misled, good caoutchouc is obtained from *Nereum grandifloreum* of Roxburgh.

It is, probably, equally abundant in *Asclepideæ;* one plant of which order, *Cynanchum albifloreum* has been stated to yield it of excellent quality in Penang. Dr. Royle seems inclined to attribute the great tenacity of the fibres of some plants of both these orders to its presence; but this seems to Mr. Griffith to be of very doubtful accuracy. §

On Nov. 17, Prof. Royle communicated to the Asiatic Society, some observations "On the Orchideous Plants which yielded Salep in Northern India." These he stated to be species of *Eulophia, E. campestris*, and *E. herbacea*, at an elevation of 7,000 feet on the Himalayas, with another plant, without flowers, but which is supposed also to be a *Eulophia*, and has been called *E. vera*. This last the Doctor obtained from the hills near the banks of the Jhilum, in the vicinity of the road from North India to Cashmere. It was brought to him by the plant-collectors, as the plant yielding the true salep of commerce of that part of the world, and which sells at a very high price even at the Hurdwar Fair. He considered that its cultivation was a subject well worthy the attention of the natives of the Himalayan provinces.—*Literary Gazette.*

* Lindley's Introd. Nat. Syst. Botany. p. 176.
† Lindley's Instructions, p. 300. ‡ Royle's Illustrations, p. 329 & 370.
§ Royle's Illustrations, p. 274.

DHAK GUM.

On May 26, Professor Royle read to the Asiatic Society, a paper on the so-called gum (*Dhakke gond*) of the Dhak, or *Palass Butea frondosa;* the great abundance of which in India renders it very desirable as an article of commerce. The large proportion of astringent matter in combination with gum renders it particularly eligible in medicine. Mr. E. Solly has analysed this substance, which he describes to be of a brilliant ruby red colour, transparent, and of an intensely astringent taste. In its impure state it is calculated to contain only about 50 per cent. of tannin; but a portion of the crude substance, purified by simple solution in cold water, and evaporation, contains 73.26 of tannin, a larger portion than in any other known substance.

ERGOT OF RYE.

On Nov. 6, was read to the Linnæan Society, a paper from Mr. J. Smith, of the Botanic Gardens, at Kew, on the growth of the Ergot in Rye and other grasses, which had been very prevalent during the previous season; the writer, in conclusion, expressing his opinion that Ergot was not an organized fungus, but the result of an active fungus.

TRANSFORMATION OF OATS INTO RYE.

Dr. Weissenborn represents a statement of this phenomenon to have been corroborated in the last annual report of the Agricultural Society of Coburg, which asserts this transformation to take place if the oats be sown very late (about Midsummer-day), and cut *twice* as green fodder before shooting into flower-stalks, whereupon a considerable number of the oat plants do not die in the course of the winter, but are changed in the following spring into rye, forming stalks which cannot be known from those of the finest winter-rye. "Let any one sow the oats during the latter half of June, and the transformation in question will certainly take place!" —*See Mag. Nat. Hist. New Series*, No. 24.

SECALE CORNUTUM.

In several parts of Germany, the wetness of last summer has caused such an extensive production of those degenerated grains of the rye, (*Secale careale,*) known by the name of *Secale cornutum*, (*Spermoedia flavus, Fries,*) that regulations have been issued directing the corn-growers to purify their rye before it is brought to market; the millers are threatened with penalties if they grind rye much adulterated with that injurious substance; and the bakers are made answerable for such poisonous qualities as may be given by it to the flour which they use.—*Dr. Weissenborn; Mag. Nat. Hist.*

DIFFERENCES EXISTING BETWEEN PEARS AND APPLES.

A long and interesting memoir has been presented by M. Turpin to the French Academy of Sciences, on the difference existing between the cellular tissues of the apple and pear; which observations are extended to knots of wood, to ligneous kernels, to the calcareous concretions found in the mantle of the Arions, and to the ossification of animals in general. Those authors most tenacious concerning the establishment of these two vegetables as different genera, have drawn their characters from the adherence of the lower part of the five styles, to their villosity, to the spheroid form of the fruit, and to the stalk being set in a cavity; characters which are frequently effaced. M. Turpin founds his on the absence or

presence of those stony concretions which are to be met with in the cellular tissue of the pear. These concretions he attributes to the aggregation of little globules, which by degrees become clogged with an indigestible matter, which is confusedly deposited in molecules, from which they receive their opaqueness, hardness, and colour, and to which he gives the name of Sclérogène. This name of Sclérogène M. Turpin also gives to all matters which are foreign to organization, which are first held in suspension, then deposited and become hard in the internal cells of the hollow and elementary organs of tissues. Of the cause of this deposit in the pear he is perfectly ignorant at present; but each concretion, chemically analyzed, consists of bladders of cellular tissue, globules or fecula contained in these bladders, and the Sclérogène, or indigestible matter, confusedly accumulated and mingled with the globules of fecula. They may be compared to numerous partial and isolated concretions in the cellular tissue of certain animals, although the latter are composed of different substances, especially those of the snail. The progress and manner of formation in these concretions M. Turpin thinks admirably calculated to shew the progress of all ossification, whether animal or vegetable.—*Athenæum.*

SEA-GRAPE.

M. ARAGO, having expressed a desire for further information respecting the place whence the floating banks of sea-weed, seen off the Azores, originally came, M. Bonnet is of opinion that this weed, which is called the Sea-grape, and is supposed to have been brought by a current from the Bahamas, grows in the place where it is found. He says that when becalmed, and the water has been clear, he has seen detached pieces rise from the bottom in fresh condition, which may easily be distinguished from those which have been for some time on the surface; and M. Bonnet is convinced that, with proper materials, the bottom of this part of the ocean might be reached. This gentleman states that, in one of his voyages, when in 23° 26′ north latitude, and 44° west longitude, the water became quite muddy, and formed a turbid line north-east and south-west, which was half a mile broad.—*Analyst.*

COLOUR OF THE BARBERRY.

ON Nov. 17, a paper was read to the Asiatic Society "On the Yellow Colour of the Barberry," by Mr. E. Solly. Mr. Solly stated that the root of the common barberry, *Berberis vulgaris*, was used for dying leather yellow; and that a cheap and abundant source of the article was desirable. He, therefore, suggested the possibility of obtaining it with advantage from India. After describing the various species of berberis which grow in India, and mentioning many of their localities, he stated that, from some experiments made by him on specimens of berberry root from Ceylon, in the Society's museum, he was convinced that the Asiatic root would prove an article of considerable value to dyers. He described the colour as being disseminated throughout the whole of the wood, bark, and roots; and suggested that experiments should be made on the relative quantity and colour in each of those parts respectively. Mr. Solly then mentioned that, as the root does not contain more than seventeen per cent. of useful colour, it might prove more convenient to import the watery extract, instead of the whole root or stem, which plan would diminish the cost of the dye. The extract is well known to the natives of

India, being the *horzis* or *rusot* of their medical writers, and might, no doubt, be easily prepared in large quantities.—*Literary Gazette.*

PUBESCENCE OF THE PLANE-TREE.

M. MORREN has made some curious remarks respecting the downy pubescence which coats the young leaves and branches of plane-trees. This down is formed of delicate branched spiculæ, which, like the elementary organs composing epidermis and other parts of many plants, consist mainly of silica, and may, consequently, be likened to extremely minute glass needles. In the spring of the year, more especially, this down readily falls off, and being wafted about by the air, is rendered noxious to gardeners, who may chance to be working in the neighbourhood of these trees. Entering at the mouth and nostrils, these spiculæ insinuate themselves into the more delicate parts about the base of the respiratory organs, and produce considerable irritation and inflammation there. It seems advisable that these trees should never be planted in the neighbourhood of hospitals, or wherever invalids are in the habit of walking.—*Monthly Chronicle.*

THE MORA TREE.

ON March 20, was read to the Linnæan Society, a description of the Mora-tree, by Mr. R. H. Schomburgk. This tree is a native of the forests of British Guiana, where it attains a large size, the trunk often exceeding ninety feet in height, with a circumference of upwards of twenty feet. The trunk produces large buttresses at its base, which from their partial decay afterwards become hollow beneath, and form a chamber capable of sheltering several persons standing erect. The tops of these buttresses, and the trunk itself, are found clothed with innumerable epiphytes, which greatly add to the singularity of the tree. The tree affords excellent timber, being close-grained, strong, tough, and durable, and not liable to split. The Mora-tree constitutes a new genus of the order *Leguminosæ*, belonging to the sub-order *Cæsalpineæ*, and tribe *Cassieæ*. The native name has been adopted for the genus, and that of *excelsa* for the species.—*Philosophical Magazine.*

CHESTNUT AND OAK.

A GARDENER at Metz has grafted a chestnut upon an oak, and the experiment has succeeded. The advantages attending it in the culture of the chestnut are very great, from the delicacy of its roots, which, by this method, may now find a substitute in those of the more robust tree of northern soils.—*Athenæum.*

THE GENERA PINUS AND ABIES.

CAPTAIN S. E. COOKE has read to the British Association a long and interesting paper on this subject, in which he stated that within the last few years, about seventy species of *Abies* and *Pinus*, exclusive of junipers, cedars, and other *coniferæ*, have been introduced into this country. The order of these species is as follows:—The first are from America; and the second (about fifteen in number,) are produced in the magnificent ranges of mountains which separate the waters of the Pacific from those of the Atlantic, known by the name of the "Douglas Group," out of respect to the lamented traveller of that name. The third are from the table lands of Mexico. The fourth is a species newly discovered in the Himalaya mountains; and the fifth, that of Europe. The trees

from America are of every form and size, but they only produce timber of second-rate quality. The "Douglas Group," it is expected, will be a valuable addition to our woodlands, one of which (the *Abies Douglasii,*) possesses the qualities of the larch, being durable, quick in growth, and of utility, when young, with the advantages, in some respects, of being an evergreen. The trees from Mexico and the Himalaya are too recent in date to be spoken of confidently. The last and most interesting of the whole are those of Europe.—*Literary Gazette.*

THE SILVER FIR AND LARCH.

Mr. Salvin, of Croxdale, near Durham, who has extensive woods of silver fir, states that when felled and left on the ground, it resists the effects of a humid climate and damp soil, better than the larch. As it is perfectly well known that the timber of the one species is very much inferior to that of the other, this curious fact is striking. It is strongly denied that there is any inferiority or defect in the larch, such as is apt to be the case when grown in soil unsuited to it, which indeed rather affects the inside than the outside of the tree. The solution is suspected to be, that the heart of the timber is preserved by the turpentine, which is deposited in the outer layers; and this is important and valuable information; wherefore experiments should be made on the silver fir as pile timber, for which, if the phenomenon here mentioned be general, the tree will, in every respect, be most admirably suited.—*Note to Capt. S. E. Cook's paper on the Genera Pinus and Abies.*

MACLURA.

The North American diœcious tree, named *Muclara aurantiaca,* is now growing in France, both male and female, and flowers in the Luxembourg garden, in the royal establishment at Neuilly, and at Avignon. Its wood is said to be elastic, it is beautifully veined, of a deep yellow, a fine grain, and takes a beautiful polish. Numerous experiments have proved that its leaves are perfect substitutes for those of the mulberry for the nourishment of silkworms, making it a desirable object for cultivation, as it does not suffer from the severest cold, and flourishes even in a poor soil. The fruits are not edible, but the roots yield a fine yellow dye. —*Athenæum.*

NEW SOUTH AFRICAN PLANT.

Professor Don has lately read to the Linnæan Society a paper, illustrated by appropriate drawings, descriptive of a new genus of plants of the order of *Bignoniaceæ,* discovered by Captain Alexander in the Great Namaqua land, in South Africa. It grows abundantly on arid sandy soils to the height of six feet, bearing luxuriant white flowers and prickly leaves, and its stamens are from five to seven in number.

NEW GESNERIA.

On May 18, was read to the Botanical Society, a description of the new species of *Gesneria,* translated from the French by W. H. White, Esq. 1st. *Gesneria mergrorhiza,* very remarkable for the largeness of its tubercle, which sometimes acquires an enormous diameter. The habitat of this beautiful plant is Brazil; it differs from *G. bulbosa* by the largeness of its bulb; by its leaves, which are corded at the base, and not rough and uneven; by its hairs being compressed against the stem, and by its flowers. 2nd. *Gesneria Heuttei,* nearly allied to *G. fancialis,* but

differing from that by its leaves being petiolate, and not in the least acute, by its peduncles not being rounded, and by its corolla not being swelled at the neck. It forms one of the most beautiful ornaments of the green-house. This also grows in Brazil, where both have been found by M. Von Heutte. They form part of the collection of M. Parthon de Von, at Anvers, and are cultivated in the Botanical Garden at Brussels.—*Literary Gazette.*

CHINESE CABBAGE.

SOME missionaries have brought a vegetable from the north of China, which is called Pét-tsaié, which is used like the cabbage in Europe, and which may be kept the whole winter. It is of the same genus as our cabbage, and is called *Brassica sinensis.* Its leaves are oval, the young plant resembles a lettuce, and is cultivated between 35° and 46° of north latitude. When fully developed, these cabbages are two feet high, and weigh from four to twelve pounds. A little frost improves them, and they are not gathered till then. They are very good when boiled, and eaten with salt. Endeavours are making in France and Piedmont to naturalize them from the seeds brought by the missionaries.—*Athenæum.*

BLOOMING OF THE CEREUS TETRAGONUS.

ON Dec. 18, a letter was read to the Linnæan Society, of Evesham, on the blossoming of this rare plant. The specimen was between nine and ten feet in height, and was twenty years old: it first blossomed in 1836, the flowers opening at sunset, and shutti g at sunrise. In the year 1837, it bore eight blooms, and in 1838, thirteen. The petals were white, slightly tinged on the base with green, the antlers and stigmas being yellow.—*Times.*

SARSAPARILLA.

ON June 9, a long paper was read to the Asiatic Society by Professor Royle, "On the so-called Sarsaparilla of India, usually said to be a product of *Smilax aspera.*" The author observed, that "Sarsaparilla, the produce of a species of smilax, being obtained from South America and Mexico, one is surprised to hear of its coming from India; though there is nothing improbable in the fact, as the genus *Smilax* is found in all the tropical parts of the world, with a few species extending south to New Holland, and north to the south of Europe, North America, China, and Japan. Several are found all along the Himalayas. In Silhet and the Garrow Hills are two species, *S. glabra* and *lancæfolia,* with tuberous roots, like those of *Smilax China.* In the peninsula of India are found *S. Zeylonica* and *S. ovafolia,* but nowhere represented as being very abundant. The most common European species, *S. aspera,* (smilazza of the modern Greeks,) found in hedges and on rocks, extends also to Syria, but has never been found in India. As the substance called Indian sarsaparilla might be furnished by some other species, Dr. Royle stated that he procured the roots so called from Mr. Dodd, of Portman-street, by whose brother they had been brought from the peninsula of India: these are remarkable for their fragrance, which resembles that of the Florentine iris. This is evidently the same substance which was some years since described as a substitute for sarsaparilla by Dr. Ashburner, by the name of *Nannari,* from Malabar. Guibourt describes a '*fausse salsapareille de l'Inde*' as being obtained by English druggists from India, and which they say is the *Smilax aspera.* Under this name, Dr. R. obtained from

Mr. Godfrey's a sort which was evidently the same as that procured from India. It only remained to ascertain the plant which yielded it. Under the head of 'Sarsaparilla, substitute for,' Dr. Ainslie describes *Nannari vayr*, or country sarsaparilla, as the root of *Periploca India*. Dr. Wight ascertained that this plant was identical with the *Asclepias pseudosara* of Dr. Roxburgh, the roots of which the latter describes as being long, slender, and having a pleasant peculiar fragrance, referring for a figure to the *Naru nindi* of Rheede, Hort. Malab. x. t. 34, and which is now the *Hemidesmus Indicus* of botanists, and of which the above are all synonymes. The plant is found in Ceylon, the peninsula of India, in Bengal, and Behar. From the testimony of Drs. Ainslie and Roxburgh, it appears that the roots of this plant are extensively, and have been long, employed by the natives of India, for much the same purposes as sarsaparilla is in Europe, whence medical practitioners in the peninsula of India were led to prescribe it with the same views; hence its name of country sarsaparilla. It is much employed in the hospitals there, and is by some thought to be more efficient than the true sarsaparilla. Dr. Ashburner, in this country, speaks very favourably of its virtues; and it is now prescribed by many practitioners. Dr. Christison informed the author that it had been prescribed in Edinburgh with favourable results, but in some cases with emetic tendency; that in distillation with water, a volatile substance passes over, which crystalizes in the water, on cooling, in long, slender needles; is fusible under 212°, and solidifies into an opaque white crystaline mass, possessing, in an eminent degree, the aroma of the plant. Dr. Royle, in conclusion, stated, that the virtues of this plant having been thus confirmed, it was satisfactory to know that, from its abundance, it could be obtained in large quantities. As the natural family, *Asclepiadeæ*, to which *Hemidesmus Indicus* belongs, contains plants employed in diaphoretics and emetics, and as substitutes for ipecacuanha, there would have been every probability of this plant possessing valuable properties, independent of European testimony on the subject. It is stated as a curious circumstance, that a plant of this family should have been considered as one of the kinds of *Smilax* of Discorides, ever since the time of the Arabs, at least; there being no doubt that the hasser, or rather *asher*, of Avicenna is Asclepias, now *Calotropis gigantea*, or *procera*, or *Hamiltonii*,—the celebrated *mudar*, itself a valuable therapeutical agent." This important contribution to Medical Botany is reported in the *Literary Gazette*.

ROOT OF THE MADDER.

M. Decaisne has lately published at Pariss ome valuable "Recherches Anatomiques et Physiologiques sur la Garance," whence he arrives at the result, "that the madder root, when living, has no colour but yellow, and that this colouring principle only varies by the deepening intensity of age." This observation may be verified by breaking two roots of different ages, and watching the change of hue from that instant till the air begins to take effect; the fluid will be perfectly transparent while in the cells, but will shortly become muddy and granulated, so as to darken parts of the cells. These granules, which are of the nature of gum resins, are partly soluble in alcohol; but as the dye of iodine fails to impart to them a blue colour, they do not shew any identity with feculum. They are scarcely visible when insulated, even with the aid of an excellent microscope divided into 300ths of millimetres.

The existence of a yellow colour is all that M. Decaisne has been able

to ascertain; and the simple yet striking fact of the absence of the red colouring principle until the root has been pulverized, seems to have been unknown to the present day.

The authors who have most fully treated this subject regard the roots as imbued with a red colour, while growing, and undergoing no change in this respect from subsequent circumstances. Many manufacturers, ignorant of this fact, to whom M. Decaisne shewed the roots in all their stages of colour up to that which they attain when reduced to powder, while they formerly exhibited no trace of a red hue, have assured the author that this result would certainly lead to important modifications. The assumption of a red colour is, therefore, a chemical phenomenon quite independent of vitality, while the yellow hue, on the contrary, seems to arise from a vital action which forbids the first: thus, if for comparison, two portions of root, one living and the other dried, be placed in a bottle, the former will preserve its yellow hue, while the second will turn red, and in two days acquire a violet tinge.

Finally, the better to establish the vital power of the cells, and to prove that the production of the colouring principle is entirely determined by their peculiar action, M. Decaisne caused two young madder plants to germinate in distilled water; they grew very little, but the tissue of their roots, notwithstanding, secreted a yellow fluid, the tint of which seemed quite as decided as in young plants of equal size raised in earth. This colouring, therefore, depends on a peculiar action of the cellular membranes, to solve which it will be first necessary to solve that hitherto inscrutable problem of the vital powers.—*An. Nat. Hist. abd.*

NEW CRIMSON DYE-PLANT.

In the south of Russia, numerous tufts of Harmala or rue of the steppes, have been remarked. It is called Inserlik by the Tartars, and its botanical name is *Peganum harmala.* Its root is strong and coriaceous, resists the plough, and is an invincible obstacle to cultivation. It is not useful for cattle, its odour being so disagreeable that they will not touch it; but it is likely to prove of immense service to the Russians in their manufactures. Attempts were formerly made to dye cloth of a red colour with the seeds; but it was a complicated process, and has been since abandoned. M. Goebel, professor of chemistry at the university of Dorpat, having analyzed these seeds, has ascertained the nature of their colouring matter, and invented a much simpler method of extraction. It is superior to most of the ordinary substances which produce seed, serves equally well for silk, wool, cotton, and linen, presenting every shade from rose to crimson, and not being subject to fade. Half an ounce of the extract is sufficient for dying six square archines, or more than three yards, of a deep crimson.

NEW BLUE DYE-PLANT.

The *Polygonum tinctorium* is now cultivated with success in the experimental gardens of M. Vilmorin, near Paris. Attention was first called to this plant by M. Jaume St. Hilaire, in consequence of its being used in China for dyeing a deep blue. M. Chevreul has examined it, and ascertained that it owes its properties to the true Indigotine, of which it yields a greater proportion than the *Isatis tinctoria.*—*Athenæum.*

GROWTH OF THE MULBERRY IN INDIA.

The Chamber of Commerce has presented Signor Mutti with the sum

of 500 rs., in testimony of the estimation in which that gentleman is held for his persevering and successful exertions for the introduction of silk culture in the Deccan. Many years of toilsome and, until lately, unaided exertion, have at length enabled Signor Mutti to prove beyond a doubt the capabilities of our territory for the growth of the mulberry on a much more favourable scale than it can be reared in other countries; in most of which, he informs us, the leaves of the tree can only be gathered once a-year, whereas here they can be gathered thrice a-year without injury to the tree. The soil and climate of the Deccan have been satisfactorily proved fully adapted for the growth of the standard tree. The bush has been found not to prosper so well, from its want of perpetual irrigation. There are fourteen species of mulberry in the gardens under Signor Mutti's management. He says, the expense attendant upon the production of silk is exceedingly trifling. A current outlay of 1000 rs. produces to Signor Mutti a return of 2724 rs.; but an expense of 4000 rs. for building had been previously incurred by him, which, of course, any speculator must expect to bear. An ultimate and early profit of seventy-five per cent, however, would satisfy the most avaricious.—*Parbury's Oriental Herald.*

PAPER FROM THE BARK OF THE MULBERRY.

PAPER of inferior qualities may be easily manufactured from the fibrous parts of many plants, without the necessity of their being first converted into thread and made up into cloth. The bark of the mulberry might be very advantageously employed for this purpose, provided the fragments of the epidermis, which tend to give it a dirty brownish tinge, could be readily separated from the fibre by some economical process. Messrs. Gerard and Predaval have proposed a method of effecting this object. They wash the materials with lime-water, and next dry them, previously to their passing through the mill. The epidermis is then readily separable from the alburnum and fibre by one process, and afterwards the fibre is easily detached from the alburnum by winnowing. The fibre is then bleached, and thus rendered fit for the manufacture of paper. —*Monthly Chronicle.*

BARBARY ONIONS.

ON October 16, there were exhibited to the Horticultural Society, from Sadi Ombark Benbay, two Barbary onions, weighing two pounds and a quarter, being imported from Morocco, the climate and soil of which country are the most celebrated for bulbous roots, like these. In that country they are so plentiful as to be sold from ten to twelve a penny.

NEW AFRICAN FRUIT.

SIR JAMES ALEXANDER, during his recent expedition in Africa, saw the *naras* growing on little knolls of sand; the bushes being four or five feet high, without leaves, with thorns on the light and dark green striped branches. The fruit has a coriaceous rind, rough with prickles, is twice the size of an orange, or fifteen or eighteen inches in circumference, and its seed and pulp resemble those of a melon. When unripe it burns the tongue and palate exceedingly, but when ripe it has a luscious, subacid taste. Sir James brought home some seeds of this fruit; from which plants were growing in March last: they were then a foot high, and beginning to branch, having two thorns at each articulation, and a

stipule scarcely to be called a leaf between them, on the axis of which was the bud, but no leaves.

VEGETABLES IN THE WESTERN CAUCASUS.

Mr. Spencer, the traveller, states, that in the country bordering the Euxine, besides the number of rare plants so interesting to the botanist, those adapted to culinary purposes are numerous, particularly the rhubarb and a species of horse-radish, which are everywhere found growing wild: the latter plant, which the natives call *batergan*, is so immense in size, as to resemble a small tree; the root frequently attains six inches in diameter, and a yard in length; it is eaten with meat, made up in a sauce; and if it does not possess the pungency of our own, it has this advantage, that its flowers when boiled are not inferior to brocoli. Wild carrots, turnips, gourds, onions, melons, and cucumbers, are also included in the Caucasian vegetables. To these may be added the *kohl rüben*, (turnip cabbage,) the cultivation of which in England might be highly advantageous; and, as it has found its way from South Russia, and now abounds in some parts of Germany, there can be nothing in our climate to prevent its growth; whilst, partaking, as it does, of the qualities of both turnip and cabbage, it could not fail of becoming deservedly popular. Mr. Spencer also earnestly recommends the culture of the linden-tree in England, as one of great beauty, and extraordinary utility.

BERTHOLLETIA EXCELSA.

Mr. Schomburgk has communicated to the Botanical Society, from Lower Prussunung, some particulars of this remarkable tree of the first size. The trunk is straight, the bark deeply furrowed, and of a dark grey colour; it reaches to the height of ninety or one hundred feet before it divides into spreading alternate branches. The locuments which the green fruit possesses, are only thin membraneous bodies scarcely to be recognised when it has come to maturity. The nuts are placed around the quadrangular spermaphomuæ in four rows, one over the other; there are generally from twenty to twenty-four nuts, seldom more. Many are opened by monkeys, peccaries, and other wild animals. The bark is easily separable, like all *Lecythideæ*, and the liber is beaten by the Indians into a mass, which they use as tinder. The wood is bitter, soft, and inside generally hollow. The Caubees call the fruit and tree Batouka, the Wapishanas, Menga, and the Macousis, Imprema.—*Athenæum.*

"CUTTING GRASS."

On November 20, was read to the Linnæan Society, an account of a new species of *Leptospermea*, by Dr. John Lhotsky, who discovered it in Tasman's Peninsula, Van Diemen's Land, growing in a dense jungle, through which its long slender leaves contrived to penetrate. It is nearly allied to the *Leptospermea elatior* of Labillardière, and is remarkable for the great length of its leaves, varying from ten to twenty feet. The leaf of the specimen exhibited was upwards of thirteen feet long. It is termed "cutting grass;" the sharp edges of its leaves inflicting wounds on the unwary traveller who passes the plant hastily.

THE ANT-TREE OF GUIANA.

On April 6, was read before the Botanical Society, a description of the Ant-tree of Guiana, by Mr. Schomburgk. This tree, (*Triplaris*

Americana,) is from fifty to sixty feet in height; its trunk smooth and greyish; the branches erect, frequently in the form of a pyramid; leaves entire, oblong, and narrow, from nine to twelve inches long, of a dark green colour; petiole dilated at the base, somewhat amplexicaule with ochreate stipulæ, and marks at the opposite direction, as of fallen-off petioles; flowers unisexual.

The *Triplaris*, in its habits of growth, leaves, stipulæ, its triangular nut protected by the calyx, the farinaceous albumen, &c., pronounces its relationship to the *Polygoneæ*, and extends from Columbia to the verge of Brazil's western boundary. The sandy banks of the inland rivers of Guiana are peopled with them; and when shrubs, stunted in growth by the poverty of the soil, scarcely reaching the height of five or six feet, the *Triplaris* overtops them forty or fifty feet. The trunk is slender and straight. The flowers of both sexes are insignificant: those of the male last only for a few days, when they dry up, as do also the petals of the females: the segments of the calyx, however, continue to grow, changing in their growth from green to white and vermilion, and become so attenuated that the branched nerves are easily perceptible. In that state, they are three times as large as the fruit, which is still protected by the tube of the calyx, and the whole resembles a shuttlecock. The risps are dense, and the tree presents now a most elegant appearance, covered with white blossoms, tinged with red, occasionally relieved by dark green leaves. The incautious botanist, who, allured by this deceptive appearance, should approach the tree to pluck the blossoms, would bitterly rue his attempt. The trunk and branches are hollow, like those of the trumpet-tree (*Cecropia,*) and provided at intervals with partitions, which answer to the position of the leaves on the outside.

These hollows are inhabited by a light brownish ant, about two to three-tenths of an inch long, which inflicts the most painful bites. Its antennæ are placed near the middle of the anterior portion of the head; mandibles triangular; peduncle of the abdomen with two rings; the anus hairy and provided with a sting, or piercer (*Myrmica*, Latr., nova species.) In biting, these ants emit a whitish fluid; their bite causes swelling and itching for several days; when captured, they attack and kill each other like scorpions.

The Arawak Indians call the tree Jacuna, and the ant Jacuna sae; the Warrows, Epouahari: the literary translation being ant-tree; the Caribis, Itassi; the colonists, from its growth, " long John."—*An. Nat. Hist. abridged.*

THE GREAT CASHEW-TREE OF GUIANA.

THE *Oubudi*, or Great Cashew-tree of Guiana, is a new and nondescript species of *Anacardium;* natural order, *Terebinthacea.* It grows to the height of 100 feet or more, and about four or five feet in diameter; its trunk being often straight and undivided to the height of sixty or seventy feet; where it begins to throw out its large and wieldy spreading branches; altogether resembling the oak in general contour, but much larger. Common report says, that this tree flowers only once in three years, which, however, is not true; for it flowers yearly in January and February. No tree affords better shade or more delicious fruit: from its fruit or pomaceous product is prepared an excellent wine; and it affords a rich and luscious harvest to birds and other animals, particularly the pecarie and ungpoorie, (the bush-hog and the tapir,) which the Indians

say become very fat during an abundant crop of this dainty fruit.—*Mag. Nat. Hist. abd.*

NEW CATTLEYA, IN GUIANA.[3]

THE description of a new species of *Cattleya*, by Mr. Schomburgk, has been read before the Linnæan Society. This splendid *Orchideous epiphyte* occurs on the trunks of trees, which grow on the banks of a tributary stream which falls into the river Rupununy, in British Guiana. It is distinguished by the surpassing beauty and fragrance of its flowers, which justly entitle it to the name of *superba*, which the discoverer has applied to the species.

PLANTS OF BRITISH GUIANA.

MR. SCHOMBURGK, during his recent interesting expedition into the interior of British Guiana, notwithstanding his series of disappointments from accidents and unhealthiness of climate, appears to have collected about seven hundred species, chiefly in the savannahs about Anna-y and along the Essequibo and Rupunoony, with a considerable number from the shores of the Berbice and Courantine. The natural orders most abundant are, *Leguminosæ Melastomaceæ, Rubiaceæ*, and *Compositæ*; and amongst the most remarkable plants, in orders less abundant in species, may be mentioned the splendid water-lily, dedicated by him to Queen Victoria; some curious new species of *Podestemeæ*, and many *Orchidaceæ* of great beauty. Mr. George Bentham, A.L.S., has communicated to the *Annals of Natural History* an enumeration of these plants; including also a collection of above three hundred species from French Guiana recently distributed by the Museum of Natural History of Paris, and similar sets collected in the same country by M. Leprieur. With a view to the interest of Mr. Schomburgk, whose losses have been very severe, Mr. Bentham adds, that several sets of about five hundred species each remain undisposed of; one set having, according to the conditions of the expedition, been deposited in the British Museum.

THE TEA-PLANT IN ASSAM.

THE tea-plant was discovered in Assam about ten years since, but little attention was paid to it, until the investigations of Captain Jenkins and Lieutenant Charleton brought the matter under the serious notice of Government. Proper officers have been sent among the hill tribes to examine the plant, and their reports lead to the opinion that ere long we shall import a part, at least, of our supply of tea from our own colonies.

Mr. Bruce has lately been on a tour to the Singphos: he saw many thousands of the trees growing in their native soils, and brought away some plants, and specimens of the seeds and leaves. He measured one of the largest of the trees, and found it twenty-nine cubits long, and about four spans in circumference at the base. The distance of the tea district from Calcutta, though great, can be but little obstacle when such a noble river as the Brahmaputra is open at all seasons for boats of largest burden, even to the foot of the hills where the tea grows.

The climate of Assam is cold, healthy, and congenial to European constitutions; its numerous crystal streams abound in gold dust, and masses of the solid metal; its mountains are pregnant with precious stones and silver; its atmosphere is perfumed with tea growing wildly and luxuriantly; and its soil is so well adapted to all kinds of agricultural purposes, that it might be converted into one continued garden of silk,

cotton, coffee, sugar, and tea, over an extent of many hundred miles.—*M. Cosh's Topography of Assam.*

On December 12, Dr. Sigmond exhibited to the Medico-Botanical Society a sample of tea grown in Assam, sent by the Secretary of the Board of Control, two importations of which have recently been made by the East India Company. Although the taste and aroma are not equal to those of the Chinese varieties, there is little doubt but when the cultivation and mode of preparation are improved, the supply of tea from India will supersede that from China.

On December 15, amongst the donations presented to the Asiatic Society, was a sample of Souchong Tea, grown and manufactured in the British territories in India. The Director stated that he had tasted this tea, and found it very good; in fact, too good for English taste, which had been accustomed to tea kept a long time. It was too new; and, after a little keeping, he thought it would not be distinguishable from the best China tea. He mentioned, that Moorcroft had stated, that tea was grown on the mountains about Birsahner, and that there was considerable commerce in the article in Little Thibet, where much of it was drunk, though it was not of a good quality. Dr. Royle remarked that in all the parts of the Himalayas, from Sylhet to the Sutleje, Chinese plants had been found, which would lead to an inference that tea might be grown there. But the plant mentioned by Heber, Moorcroft, and others, was not really tea; though an infusion of its leaves was drunk by the Nepalese.—*Athenæum.*

CULTURE OF TEA IN EUROPE.

In a letter from the Abbé Voisin to M. Stanislas Julien is a statement, which proves that the tea-tree may be cultivated in our northern climates. The former has resided twelve years in China, near the frontiers of Thibet, in which country all the species of tea are successfully cultivated; although the degree of cold there much exceeds that of our winters, and the snow never melts before the end of April. Twenty-four treatises concerning tea have been composed in China, from the seventh century to the present time, and which contain all the requisite instructions for the culture and preparation of the plant.—*Athenæum.*

(Of the practicability of the growth of tea in Europe there has long been no doubt; indeed, the experiment has been made with success in Wales. The only doubt lies in the secret of its preparation.—*Ed.*)

In no country of Europe is tea imported in such perfection as in Russia. Conveyed by land through the medium of the large fairs at Ladak and Nijin Novgorod, it retains the virtue of which a sea-voyage is said to deprive it; while its flavour is much enhanced by the leaves of the *olea fragrans*, with which the Chinese pack it for a land journey.—*Elliott's Travels.*

A NEW PRINCIPLE OF FENCING

Has been constructed by Mr. Breeze, according to the laws of Vegetable Physiology. It consists of planting and growing trees, or shoots of the same species, or species of the same genus, and causing them to unite by "grafting by approaches, or in-arching." Having been planted a foot apart, sloping in opposite directions, the bark should be removed from the stems, where they cross each other, and the stems tied together; when they will soon unite, and then form a natural living fence, acquiring strength every year.—*Literary Gazette.*

Geology and Mineralogy.

NEW GEOLOGICAL MAPS.

At the late meeting of the British Association, the following new Geological Maps were exhibited and explained. Mr. Murchison gave an account of his new map of the Silurian Region, with sections of the strata, plates of the fossils of that region, &c. The map was large, and on it he pointed out eight colours, each of which represented a series or system, and bore a name indicative of the system it covered; the term "Silurian" being now applied to what was formerly termed the "transition" rocks. One feature of these rocks is, that they are quite zoologically independent of the overlying rocks.

Mr. Griffiths next explained his large and richly-coloured geological map of Ireland. He spoke in high terms of the Ordnance Survey now in progress in Ireland, from which a map is preparing on a scale of six inches to a mile, and which is one of the completest maps ever produced; gentlemen's seats, parks, farms, even houses and lanes, being described upon it.

Professor Buckland said, Mr. Murchison's map must now be a standard work to the end of time; he also praised Mr. Griffiths's map. He contended that a series of geological works should be perfected and published by the Government, as was done by the United States. This would be the means of saving many thousand pounds to individuals engaged in mining, who sometimes found, after they had spent their money in sinking for coal, that the coal was already exhausted.

GEOLOGICAL MODELS.

Mr. Sopwith has laid down a method by which the commonest workman can make geological models, shewing not only the position and thickness of the strata in a vertical section, but the actual surfaces and imbedding of the strata lying in different planes; so that one tray of the model being taken from above the other, we may consider that we have the stratum in miniature, with every undulation and indentation upon it. —*Athenæum.*

Dr. Buckland, Professor Sedgwick, and others, bear testimony to the beauty and accuracy of this model. One advantage is, that it makes the Commissioners of Woods and Forests acquainted with every particle of coal under the forest, so that not a bit of it can be wasted or destroyed without their knowledge. It also shews them where and how it ought to be worked, and by that means will enable them to prevent a recurrence of that horrible loss of life and destruction of property, which has hitherto so frequently taken place. Mr. Sopwith states, that one of the uses of such models is to point out the partitions of mining property, and prevent trespass. In cases where two mining properties join each other, it is extremely difficult to keep the workings of one clear of the other. He remembers a case in which such a model would have saved 40,000 guineas. A lease was taken of part of a mine, and a condition was at-

tached that a guinea should be paid for every square yard of coal taken in trespass; and it so happened that the workmen mistook their way, and worked the coal in one direction, whilst they imagined that they were working in a diametrically opposite direction, and 40,000 square yards of coal were wrought before the mistake was found out.

GEOLOGICAL MEDAL.

THE occurrence of *secondary* fossils in rocks of the *tertiary* period, and the deposition of fossil shells in vast numbers over the bed of the present ocean, from the encroachments of the sea along many parts of the English coast, having been strongly urged at the Bristol meeting of the British Association, in proof of the extreme caution which should be used in adopting the principles proposed by Mr. Lyell and the celebrated French conchologist, M. Deshayes, for determining the relative ages of the supracrustaceous deposits, with a view to their arrangement in chronological order, the Academy of Sciences at Haarlem has announced the following subject for a prize essay in 1840:—"To determine the probable extent to which the fossils of certain deposits may have become imbedded in others of more recent origin, as a consequence of the destruction of the more ancient rocks contributing to the formation of such as are of later date; also, to point out the best means for guarding against the erroneous conclusions which geologists might be led to form, from the remains of animals or plants belonging to *two* or more *distinct* periods being thus associated in the same formation." The reward offered for a satisfactory reply, written in Dutch, German, French, English, or Latin, is a gold medal of the value of 150 florins, and the same amount in money.—*Athenæum.*

GEOLOGY OF NORTH AMERICA.

ON November 26, Dr. Daubeny read to the Ashmolean Society, a paper "On the Geology of North America," pointing out the evidences of diluvial action which that Continent exhibits, tracing the great chain of primary rocks, which, under the various names of the Blue Ridge, the White Mountains, &c., extends from the Carolinas to the Canadas, and afterwards illustrating the characters of the formations in the valley between the Blue Ridge and the Mississippi. The most recent of these is an extensive coal formation, of the same date, probably, as that of England: that on the western side of the Alleghany chain being anthracitic, whilst on the eastern side there are beds of bituminous coal. The intermediate rocks on the western side of Blue Ridge seem to belong to the greywacke or Silurian system; and it is interesting to find, that the thermal waters of Virginia occur exactly on the line along which these strata were heaved up, or, in other words, precisely along their anticlinal axis, as is the case in many parts of Europe. The Professor, in conclusion, pointed out the situations and geological relations of the other thermal waters in the United States, and considered how far they might be traced to volcanic action. Dr. Buckland made some observations on the value of these notices in connexion with Mr. Murchison's researches into the Silurian system of rocks in South Wales, and concluded with some remarks upon the specimens on the table, particularly on a fragment of red sandstone, on which were the footmarks of a gigantic bird.—*Athenæum.*

GEOLOGY OF SOUTH AMERICA.

MR. DARWIN,* in a recent communication to the Geological Society, has given a very striking view of the structure of a large portion of the South American Continent, and has brought to this country the remains of various fossil animals of entirely new kinds, of exceeding interest to the zoologist as well as the geologist, Amongst the latter is a gigantic mammifer, which has been reconstructed in idea by Mr. Owen, upon the evidence of a fossil skull, and has been named by him the *Toxodon Platensis.* This animal, although a *Rodent,* according to its dental characters, in other respects manifests an affinity to the *Pachyderms;* and also to the *Dinotherium,* and to the *Cetaceous* order. Many other fossil animals have been discovered in South America; and all, from their magnitude, fitted to excite our wonder, when we consider the diminutive size of the present races of animals which inhabit that country. The animal remains found by Mr. Darwin, comprise, besides the *Toxodon,* which extraordinary animal was as large as a hippopotamus, the *Megatherium,* and four or five other large *Edentata;* an immense *Mastodon;* the horse; an animal larger than a horse, and of very singular character, of which a fragment of the head has been found; parts of *Rodents,* one of considerable size; and a Llama, or *Guanaco,* fully as large as the camel. Looking at the general mass of Mr. Darwin's results, his voyage round the world may be considered as one of the most important events for geology which has occurred for many years.—*The President's Address to the Geological Society; Anniversary of* 1838.

MINERAL WEALTH OF AFRICA.

M. RUSSAGER writes from Fasoglo, on the Blue River, February 8th, 1838:—"We found rivers, the alluvial soil of which is so rich in gold that the extracting of it is very feasible; but the richest spot of the whole became known to us quite at the end of our journey, in Fasoglo itself. Between the mountain ranges of Fallown and Fasangoru lies the valley of the river Adi. The whole valley is covered, in an area of between two and three geographical square miles, with quartz mountains, which contain quartzose iron ore, with pure gold. We found this metal in considerable quantities in the solid rock and in the boulders of the river. I bring, among other specimens, a piece of quartz with pure gold, in which there is a grain of gold of two carats. The alluvial soil between these quartz mountains in the whole extent of the valley is, in fact, prodigiously rich in gold, and there are on the Adi many gold washings of the negroes, of which nobody has had, till now, any information, so secretly did they contrive to keep the affair. A thousand men might be set to work here at once; and, with an extremely trifling charge, which would involve no expense, in the mode hitherto observed by the negroes themselves, one man may obtain every day gold to the value of three or four dollars".

BOG EARTH.

MONSIEUR ORGUESSON, proprietor of immense portions of land in the neighbourhood of Helsingfors, in Finland, has invented an apparatus, by means of which he renders bog earth as hard and compact as coal. In this state, it easily takes fire, gives a pure and brilliant flame, and produces as much heat as, if not more than, coal.—*Athenæum.*

* In July, 1831, H.M. ship *Beagle,* was commissioned for the purposo of surveying the southern parts of America, and afterwards circumnavigating the globe; Mr. Darwin being appointed naturalist to the Expedition.

MINERAL WEALTH OF IRELAND.

FORTUNATELY for Ireland, (and it is to this circumstance that she is chiefly indebted for the general fertility of her soil,) limestone predominates greatly over all other substrata in that country. The limestone country is mostly flat, and, except in the boggy districts, extremely fertile. Many parts of it, particularly in Kilkenny, Limerick, Galway, Cork, King's County, Roscommon and Armagh, produce beautiful marbles of various colours.

Valuable roofing slate has been discovered in several districts, and quarries are now worked with success on the banks of Lough Derg, at Glenpatrick, in Waterford, at Valentine Island, off Kerry, and at other places. Veins of copper and lead have been found, and partially worked, in various parts of the country; but the only mines of importance now worked are those of copper in the counties of Wicklow, Waterford, and Cork, and of lead in Down, Armagh, Wicklow, and Clare. Coal is found in Ireland in seven distinct localities, called the Leinster, the Tipperary, the Munster, the Monaghan, the Connaught, the Tyrone, and the Antrim. It consists of the non-flaming, or anthracite, and of the bituminous or blazing coal; the first being found south and the other north of Dublin. The bituminous coal is inferior to that of England; but it is thought probable that, by a proper construction of the grate, the non-flaming coal of Ireland may be used with advantage for locomotive engines, as it causes no smoke, and is much more durable than any other variety of coal. The Connaught coal district contains the Arigna ironworks, (the only works of that kind in Ireland,) where cast-iron of the best quality has lately begun to be made at a very moderate expense.—*Second Report of the Irish Railway Commissioners.*

At a late meeting of the Geological Society of Dublin, Mr. Mallett exhibited specimens of Irish minerals. The most important were—ochres from Howth and Lambay, for making pigments, of which eight were shewn; Fullers' earth from Lambay; porcelain clay, from the Sutton side of Howth; sand for moulding, from Belfast Lough, said to be superior to the English, and quite equal to the Scotch; a mass of conglomerate, cemented by arragonite, from Salthill, Kingstown; and a specimen of sulphuret of nickel, from Cheffoy Hill, county of Mayo, it being the first time that the latter mineral has been discovered in Ireland.—*Civil Engin. and Arch. Jour.*

LOCALITY FOR BROOKITE.

THIS extremely beautiful and rare mineral is generally supposed to be one of the productions of Snowdon; but the true locality of it is on the road between Beddgelert and Tremoddoc, Carnarvonshire, about eight miles from Snowdon. It there occurs in large and distinct crystals, many of which are transparent, accompanied by rock-crystal and Chavelandite, in cavities, and adhering to the walls of a very large irregular vein of quartz, in a somewhat slaty grawwacke rock; the writer having found two crystals of anastase in the same vein.—*G. B. Sowerby; Mag. Nat. Hist.*

QUICKSILVER MINE.

IN consequence of the great consumption of quicksilver in Mexico, and the price of this metal in Europe having recently been doubled, the commissioners of the Real del Monte and Bolaños Mining Companies directed researches to be made in those districts where it was known to

exist. Ores of quicksilver have, consequently, been traced in localities very remote from each other; and Mr. Taylor has detailed to the Geological Society the mine of San Onofre, near the town of El Doctor. This mine is said to be in a regular vein, which is from two to three yards in width, and intersects a calcareous hill of considerable height. The gangue is chiefly carbonate of lime, with sulphate of barytes, and a small portion of silex. The ore is mostly in the state of cinnabar, partly hepatic; but native quicksilver occurs in some specimens, and, more rarely, native calomel. When separated imperfectly from the matrix, a sample produced 40 per cent. of quicksilver.—*Proc. Geolog. Society.*

CAVERN IN MORAVIA.

One of the most curious caverns in Moravia is that called the Macocha, which lies between Williamowitz and Neuhoff. This cavern possesses the remarkable property of attracting electric matter; hence the peasants, whenever the atmosphere indicates an approaching thunder-storm, retreat with their flocks and herds from such a dangerous neighbourhood. The depth of this cavern is likewise so great, that when a stone is thrown into it, eight seconds elapse before it is heard to reach the water at the bottom; and if a pistol is fired into it, the report heard is equal in loudness to that of a cannon, at the same time the smoke from the powder uniting with the damp vapour of the cavern, remains nearly an hour on the top in the form of a bell.—*Spencer's Travels.*

GROUND ICE OF SIBERIA.

Professor Baer, of St. Petersburg, has communicated to the Royal Geographical Society, a paper on the Ground Ice of Siberia, which has been followed by a letter, on the same subject, from Prof. Adolph Erman, of Berlin, in which the fact of frozen ground extending to the depth of nearly 400 feet at Yakutsk, is clearly established. This interesting subject has been resumed by Professor Baer, in a paper presented to the British Association, in which, having described the experiments in progress in a shaft or well at Yakutsk, the Professor mentions as important probable results: "if, as is the case at Yakutsk, the ground never thaws at the depth of from 3 to 400 feet, all the small streams whose superficial waters are only kept fluid in the summer, must be in winter entirely without water; and, *vice versâ*, we may conclude that all rivers which do not come from the south, and whose course is entirely within those countries which preserve perpetual ground ice, and yet do not cease to flow in winter, must receive their waters from greater depths than those which remain in a frozen state. It is, then, clear that these veins of water penetrate the perpetual ground ice; which circumstance is not devoid of interest in the theory of the formation of springs. In the narrative of Admiral Wrangen's travels, still in MS., there occurs a remarkable instance of very large rivers in very cold countries being without water in winter, like our ditches and small brooks. He was riding to the north of Yakutsk, in about 65° lat., over the ice of a large river, when the ice suddenly gave way, and his horse went under; he himself being saved by being thrown upon the ice at the moment his horse fell. The Yakutskis, who accompanied him, however, got poles and broke away the ice, under which the bed of the river was perfectly dry, as well as the horse and his saddle. The Yakutskis were, therefore, aware that there was no water in the winter time at the bottom of rivers of this size;

and in this case the water must have disappeared before the ice had gained sufficient thickness to bear a loaded horse.

Perpetual ground ice extends much farther in a southerly direction in Siberia than in Europe; and the whole of the south-eastern angle of Siberia has perpetual ground ice. Captain Frehre speaks of frozen stratum in lat. 52°, which in the forests, where the rays of the sun were intercepted, thawed only from three-quarters to one foot deep; which fact demonstrates how little is necessary for the ground to be thawed for trees to grow on it. The development of the leaves and vegetation depends less upon the temperature of the soil than on that of the air in the spring; it only requires that the ground should be so far thawed that the tree may be able to draw from it moisture enough for its growth. M. de la Beche considered that the above paper shewed that the temperature of those regions had changed since the deposit of the detrital matter, (for such was the character of the frozen ground,) inasmuch as under the condition of perpetually frozen surface, no deposits could take place. It was obvious, that if a hole were dug in this country, and the air were kept constantly below the freezing point, all the water in the ground round the hole would be frozen; but such explanation would hardly answer in this case. Captain Washington observed, as 6° R. (45° Fahr.) is the mean surface temperature at Yakutsk, according to the known law of the increase of heat downwards, about 100 feet for each degree of Reaumur's scale, the freezing point would not be reached till 600 feet; yet the frozen ground was here found to extend only 400 feet in depth; wherefore the surprise was greater that it had been found at so small instead of at a greater depth; but it appeared to him, that the exact nature of the soil, and the height of Yakutsk above the sea, were important elements to enable us to arrive at a correct conclusion on this subject. Capt. W. suggested that experiments might be made in the Arctic regions; and Sir G. Back stated that in Messrs. Dease and Simpson's last enterprising journey along the Arctic shore of America, they had not found the ground thawed to a greater depth than one foot.—*Abridged from the Athenæum.*

ARTESIAN WELL AT PARIS.

The boring of an Artesian well, at Paris, having reached the depth of 1,345 feet in August last, and the funds being exhausted, M. Elie de Beaumont was requested to examine the soil lately brought up, and to say whether it afforded any indication by which the thickness of the bed to be pierced, before arriving at the sand, might be inferred; and he was of opinion, that the bore had reached the lower beds of the chalk formation, and that the marls, &c. which still intervened between the bore and the stratum, where the water will be found, would probably be less than 328 feet thick. If M. de Beaumont's anticipation should prove correct, the well will have a depth of 1,600 feet. The boring has since been resumed, and, in January, had attained the depth of 1,400 feet, without finding water.—*Times,* Jan. 11, 1839.

SULPHUREOUS ARTESIAN WELL.

In one of the experimental borings of M. Meher, engineer of the Bruille mines, near Valenciennes, has sprung up an Artesian well of hot sulphureous water, of 25° Reaumur. The borer had reached about sixty-five metres from the surface, when suddenly a noise like a clap of thun-

der, was heard; smoke issued; the rods were shot out of the bore; and the hot water sprung up to a great height.—*Echo de la Frontier.*

NATURAL SODA FOUNTAIN.

MR. SPALDING, an American missionary, writing from Fort Vancouver, beyond the Rocky Mountains, describes this phenomenon, which he passed three days' journey from Fort Hall. The fountain has several openings; one of which is about fifteen feet in diameter, with no discovered bottom. About twelve feet below the surface are two large globes, on either side of this opening, whence the effervescence seems to rise. A stone cast in, after a few minutes, violently agitates the whole fountain. Another of the openings, about four inches in diameter, is through an elevated rock, from which the water spouts at intervals of about forty seconds. The water, in all its properties, is equal to any artificial fountain, and is constantly foaming and sparkling. It is stated to be very salubrious.—*Athenæum.*

SALTNESS OF THE OCEAN.

FROM trials which Dr. Danberry has made with his own instrument, (figured in 51st vol. of the *Transactions of the Society of Arts*, and with which he had twice drawn up water from a depth of 80 or 100 fathoms,) he has ascertained, that there is a greater quantity of saline matter in the water at a distance from the Continents of America and Europe, than near the coast; and that, in one instance, the water drawn up from a great depth contained a greater proportion of salt than that at the surface.

THE LAKE OF ARENDSEE.

THIS mysterious lake has hitherto been considered unfathomable, and within the memory of man it had never frozen; the great depth of its water preventing the latter taking a sufficiently low temperature through that severity and duration of frost which the winters of northern Germany commonly present. Last winter, however, this phenomenon did occur, long after the great rivers had been covered with a solid crust; and having spent its free caloric in large masses of vapour, which for many days hovered over its surface and banks, on January 31, the lake was one smooth and polished plate of ice, varying from four to nine inches in thickness. This was a convenient opportunity for taking accurate measurements of the depth of the lake; when it was ascertained that the opinion of its being unfathomable is unfounded; its general depth not exceeding 157 feet, and its extreme depth 161 feet.—*Dr. Wissenborn; Mag. Nat. Hist. abd.*

Among the several remarkable phenomena presented by this very celebrated Lake is its throwing out yellow amber; which is only found on its eastern bank; and the more violently the west wind blows, the more yellow amber is there collected. The size of the fragments does not, however, generally exceed that of a French bean. —*Spencer's Travels.*

TRAVELLED STONES.

M. K. E. VON BAER relates two examples of the removal of blocks of granite, which he conceives to have been effected by masses of ice on the south coast of Finland. One of the instances is particularly remarkable, from the height to which the travelled stone has been carried.

Near Kittleholm, in the vicinity of Sweaberg, is to be seen on a fixed rock, a loose reposing stone of considerable size, which in form resembles a seal. The height of its position is about three fathoms above the level of the sea. The inhabitants of the coast assert this stone to have first made its appearance in the year 1814 or 1815. The second instance is especially curious, from the people of the coast declaring that they recognise the stone perfectly, and that thus they can prove a journey of 250 fathoms, or half a verst, in one winter. Its transport took place about the year 1806 or 1807; and it occurs also in the neighbourhood of Kittleholm, but on the opposite side from the first mentioned block.

These notices are not unimportant for the theory of the distribution of the granite blocks of the north; although they are just as insufficient to explain the phenomena as a whole, as are all the other known examples of the wanderings of stones that have taken place in historical times. They are also of importance in lending strength to the conviction, that only marks cut in the fixed rock can afford sure data respecting the changes of the level of the sea, in relation to the surface of the land.—*Jameson's Journal.*

SUBTERRANEAN HEAT.

Professor Jameson observes that Bischof's explanation of the higher temperature that prevails in the depths of the ocean, the hypothesis of Babbage and Herschel on the heating of the solid parts of the earth, and the views of Keilhan, Fox, and others, on subterranean and submarine action, are all tending to the evolution of some important geological principles.

M. Waferdin has reported to the French Academy of Sciences a notice of a pit sunk at St. André, (*département de l'Eure,*) and of observations of temperature made in that pit, at a depth of 830 English feet. Two thermometers were sent down, each inclosed in a glass tube, sealed at its two extremities; and, after a period of ten hours, the one indicated 64° 32 F., and the other 64° 27 F. The point of departure has been the only pit in the *commune*, found to be 53° 96 F., at a depth of 246 feet. By calculating according to these data, the increase of temperature with the depth, we find it to be 1° 8 F. for every 101 feet 6.55 inches.

Dr. Magnus, with his *Goethermometer*, has experimented on the temperature of a bore, near Burg, to the depth of 457 feet, and has found the increase of temperature to be pretty regularly 2° 25 F. for every 100 feet.

The temperature of the ground in Siberia presents some paradoxical phenomena. A well, in the town of Jakouzk, being excavated 50 feet, in the hope of reaching unfrozen strata, and which would be capable of supplying water, was always, when M. Erman, jun. made the trial, at the temperature of 18° 5 Fahr. The temperature of the surface of the soil should not at the time have exceeded this degree of cold, since the latitude of the place was 62° 1′ 29″; which result has since been confirmed. It follows, that, in boring deeper, unfrozen strata will not be reached till the increase of heat resulting from the approach to the centre of the globe shall amount to 45½° Fahr., or, at a depth of 533 or 639 English feet. Subsequent observations to the depth of 400 feet have confirmed this opinion, and indicated for the strata of this country an increase of 2° 25 Fahr. to about 60 feet; that is, a much

more rapid increase than has been observed elsewhere; in explanation of which M. Erman attributes to the upper strata over northern Asia a greater conducting power of heat than to the other parts of the globe which we inhabit.

In the Real del Monte mines has been observed a general increase of temperature downward, corresponding to about 1° Fahr. for every sixty-nine feet.

M. Baer states that in digging to observe the temperature of the ground in Novaïa Zemlïa, he always found solid ice at the depth of about two feet and a half; this ice he is disposed to consider in the light of a rock which existed anterior to the stony rubbish which now conceals it.

EARTHQUAKES, VOLCANOES, AND ELEVATIONS.

On March 7, was read to the Geological Society, a paper by Mr. Darwin, " On the Connection of certain Volcanic Phenomena, and on the Formation of Mountain Chains, and on Volcanoes, as the effects of Continential Elevations." Mr. Darwin commenced by describing the phenomena which accompanied the earthquake that destroyed Concepcion on the 20th of February, 1835; and he shewed the intimate connexion, which that event proved to exist, between the shocks of an earthquake, the outbursts of volcanic irruptions, and the elevation of land. The earthquake was felt simultaneously at Concepcion, the island of Juan Fernandez, 360 miles to the N.E. of that city, and in the island of Chiloe, 350 miles to the south of it: but he mentioned several instances of earthquakes having been felt over still greater areas. During the shocks on the 20th of February, or immediately after them, the volcanoes in the portion of the Cordillera opposite Chiloe exhibited increased energy. Osorno, which had been in activity for at least forty-eight hours previously, threw up a thick column of dark blue smoke; and directly it had passed away, a large crater was seen forming in the S.S.E. side of the mountain. Minchinmadiva also commenced a fresh period of violence. The Corcovado, at the time of the principal shock, was quiet; but a week afterwards, when the summit was visible, the snow had disappeared from the N.W. crater; and, on Yntales, to the south of the Corcovado, three black patches, resembling craters, were observed above the snow line after the earthquake, though they had not been noticed previously to it. The volcanoes of Central Chile, and several within the Cordillera to the north of Concepcion exhibited, also, great activity. A submarine volcano likewise burst forth near Bacalao Head.

With respect to the connexion between the shocks of an earthquake, and the irruptions of a volcano, with an elevation of the land, Mr. Darwin repeated, on the authority of Captain Fitzroy, the fact, that not only was the main coast sensibly raised, but that the island of Santa Maria, thirty-five miles to the S.W. of Concepcion, was elevated six feet at its southern extremity, and ten feet at its northern; and that the island of Tubul to the S.E. of Santa Maria, was raised six feet. The author then proceeded to consider the formation of mountain-chains and the phenomena of volcanoes, as the effects of continental elevation. Mr. Hopkins in his *Researches in Physical Geology*, has shewn, that if an elongated area were elevated uniformly, it would yield or crack parallel to its longer axis, and that, if the force acted unequally, transverse cracks, or fissures, would be produced, and that

the masses thus unequally disturbed, would represent the irregular outline of a mountain-chain. In applying to the structure of South America these deductions from mathematical investigations, Mr. Darwin again dwelt upon the intimate connexion of all the phenomena detailed in the first part of his paper; and he shewed, at some length, that they are all explicable on Mr. Hopkins's views respecting the elevation of great areas. In conclusion, he insisted upon the elevation of the Cordillera into a mountain-chain, by movements as small as those which have been noticed in the coast of Chile during earthquakes. The strata, in the central parts of the Cordillera, are generally inclined 45°, and are often vertical; and the axis is composed of granitic masses, which, from the number of dykes branching from them, must have been in a fluid state when propelled against the lava strata. How, then, observed Mr. Darwin, could the strata have been placed at once in their present position, with wide intervals between them, without the very bowels of the earth gushing out, as in the case of volcanoes? If, on the contrary, it be assumed that the Cordillera were elevated by a succession of very small movements, and after long intervals, the fluid rock would be retained, and time allowed for it to become solid, before the next movements would open the fissures. By a succession of such operations, the stratum might ultimately be placed in any position, and at any height; and the crystaline nucleus gradually thickening, the surrounding country would not be deluged with molten matter.—*Literary Gaz.*

EARTHQUAKE IN CHILI.

On the 7th November, 1837, an earthquake occurred at Valdivia, which is said to have been more severe than any hitherto felt in that town. The first shock took place at five minutes past eight in the morning, and lasted till a quarter past eight; and so great was the movement of the ground during this period, that it was with difficulty any one could stand upright. Repeated shocks continued at intervals till three-quarters past twelve, but with less violence. The only two churches that existed in the town, as well as all the public buildings, have been completely destroyed; as probably would have been all the houses, had they not been built of wood. This earthquake was also slightly felt in the town of Concepcion, and it was remarked that the sea receded partially towards the centre of the bay of Talcahuano, and that the ebb and flow of the tides were interrupted for some days.—*Proceedings of the Geological Society.*

EARTHQUAKE IN SCOTLAND.

The shock of an earthquake was felt on the night of Monday, the 30th of July, at Turriff, which threw down a part of the churchyard wall. Only one similar event is remembered by the oldest inhabitants of the place.—*Literary Gazette.*

DISTURBANCE OF THE SOIL.

On the 2nd of February, a remarkable phenomenon took place near Sassarie, in the valley called Baddi Partusu, in a space of about 500 square paces. Some hundreds of olive, and other trees, were torn up by the roots, broken, and thrown to a great distance. New rocks appeared which had not been before seen, and the old rocks presented wide and deep clefts. An enormous piece of rock, nearly 100 feet long,

and 50 in width and thickness, was displaced, and the whole of the ground appeared to have been lifted up and torn. The inhabitants say it was accompanied by a great noise, but no cause has as yet been discovered for this disturbance.—*Athenæum.*

RAISED BEACHES AT COQUIMBO.

Mr. Pentland has lately observed at Coquimbo, raised beaches on a very large scale, and attaining an elevation of 400 to 500 feet above the present sea-level. They consist of beds of sea-sand, alternating with others, exclusively formed of large oysters, and in general capped by a mass of boulders and gravel, some of the former weighing several tons, and covered with parasitic marine molluscs. It is this modern marine deposit which forms the parallel roads spoken of by Captain Hall, and referred to by Lyell, and which has evidently been raised at a very modern period, many of the shells preserving their brilliant colours. The vicinity of Coquimbo is composed of a transition granite, with masses of porphyry in veins, and both contain the rich metallic veins of the district. The Andes in this neighbourhood, (Tacna, Peru,) are very high; the country around the town is an arid sandy desert, covered with loose sand of the new red sandstone series, through which the quartziferous trachyte rises near Tacna, and continues to form a band at the base of the Andes.—*Jameson's Journal.*

THEORY OF VOLCANIC PHENOMENA.

On January 31, was read to the Geological Society an extract from a letter from Sir John Herschel, in continuation of his theory relative to the increment of temperature from below, which would be produced in certain portions of the earth's crust by the partial distribution of additional sedimentary matter over the bottom of the ocean; and of the effects which would naturally result from this operation, producing the phenomena of earthquakes, and elevation and depression of strata. Sir John having noticed the coincidence of his speculations with those of Mr. Babbage, concludes by observing that "a central heat may or may not exist for our purposes. It seems to be a demonstrated fact, that temperature does, in all parts of the earth's surface yet examined, increase in going down towards the centre, in what I feel almost disposed to call a frightfully rapid progression; and though that rapidity may cease, and the progression even take a contrary direction long before we reach the centre (as it might do, had the earth, originally cold, been, as Poisson supposes, kept for a few billions or trillions of years in a firmament full of burning suns, besetting every outlet of heat, and then launched into our cooler milky way;) still, as all we want is no more than a heat sufficient to melt silex, &c., I do not think that we need trouble ourselves with any inquiries of the sort, but take it for granted that a very moderate plunge downwards in proportion to the earth's radius will do all we want."

On May 31, Mr. Brayley delivered at the Royal Institution an interesting paper on this subject, in which the new theory of Herschel and the chemical theory were alike illustrated; and the lecturer inferred that if the theory of volcanoes dependent on that of the secular variation of the isothermal surfaces were true, (and on this point a strong affirmative opinion was expressed,) then the chemical theory must also be true; as being necessarily involved in the former.

SUBMARINE VOLCANO.

It appears from a collection of facts by M. Daussy, that a submarine volcano exists in latitude 0° 20′ S., and longitude 22° west of Paris. Numerous vessels passing about this point have experienced shocks as if they had struck on a coral rock, or sand bank; noises have been heard under water; the ships have been agitated; and cinders have been found floating about.—*Railway Magazine.*

LUNAR VOLCANOES.

A short notice of "Lunar Volcanoes," has been communicated to the British Association, by Mr. Webb. He had for some time examined the moon with an excellent five-feet achromatic, and had found that several volcanic vents existed not laid down in Schroeter's map of the lunar surface; and, also, that several vents, which had been so laid down, were now much enlarged in dimensions. Upon the whole, however, he considered that the moon and earth were similar in this respect—namely, that volcanic action was now less violent than it had been in by-gone periods.

Mr. Lyell said, that the value of these observations depended entirely on the point, whether Schroeter's map of the moon could be relied upon for accuracy or not. He believed it was quite correct at the time it was made, but could not speak positively. Sir John Herschel had lately told him that the moon's mountains were not higher than the earth's, but bore about the same relation to her own size that the earth's bore to hers.—*Athenæum.*

ÆTNA AND VESUVIUS.

Ætna has been in a more violent state of eruption than usual. Early in the morning of Jan. 1, 1839, Vesuvius burst forth with an explosion like the report of a cannon, and a dense cloud of smoke and ashes soon covered Naples; but the wind changed, and carried the cinders towards the shore at Portici. The eruption ceased in the evening, but the detonations recommenced on the 2d, and continued throughout the day. In the evening, the Vesuvius was all on fire, and the lava flowed down into the plain between Portici and Torre del Greco, committing great ravages. On the 3rd the mountain became more quiet, but in the evening sent out continual flashes, which is a phenomenon extremely rare. —*Letter from Naples,* Jan. 5.

FOSSIL ORGANIC REMAINS.

Infusoria.—On January 16, Professor Ehrenberg exhibited to the Friends of Natural History, at Berlin, samples of the siliceous earth, which had been found a short time before, near Ebsdorf, in the neighbourhood of Lüneburg, in Hanover. This earth, which has been discovered at six different places in the same district, forms two layers of different colours, and is covered with one of peat earth only one foot and a half thick. The upper stratum, which is from eight to ten feet thick, is very white, and consists of pure silica, according to the analysis of Professor Wiggers, of Göttingen. The second, the colour of which is brownish grey, is, at least, ten feet thick: it also consists of silica, with a small portion of bitumen; the latter disappearing on the earth being heated, its colour likewise becoming white. As Professor Hausmann, of Göttingen, suspected this earth to be composed of the remains of organic beings, he sent samples of both the varieties to Professor Ehrenberg,

who examined them under the microscope. Both are much alike in their composition, and not only *contain* the minute shields of Infusoria, but *consist* of them. Professor Ehrenberg had distinguished in them sixteen different organic bodies, of which fourteen are the siliceous *testæ* of Infusoria. The white or upper stratum is entirely composed of such *testæ*, in a state of perfect preservation, with a slight admixture of grains of quartz; much resembling, in this respect, the mountain meal (berg-mehl) of Santafiora, but it is purer. Professor Ehrenberg had already distinguished twelve different species of Infusoria; but, what is more remarkable, this upper stratum contains an admixture of vegetable substances and forms. In the lower part of the sample were found the pollen of a species of Pinus and the siliceous spiculæ of sponge, in the proportion of about one-tenth. Professor Ehrenberg then demonstrated, on living earth-worms, that the digestive process in these creatures has not the effect of destroying the structure of the siliceous integuments of the Infusoria, but that the Bacillariæ, which they devour in great quantities, lose only their animal constituents, their *testæ* being voided in a perfect state.

On Feb. 20, Professor Ehrenberg reported that the severe cold (— 18-20° R.) had not killed all the Infusoria in the vegetable mould of the deer-garden near Berlin; but, on the lumps of earth being cautiously thawed, many of the animalcules moved about, though a great number appeared to be dead. He also exhibited a large mass of the Infusorial earth from the lake of Lillhaggsjon, which, from time immemorial, has been added to flour, in making bread. On April 17, Professor Ehrenberg mentioned that perfectly dried wheat-animalcules and other Infusoria could not be revived; a fact which he had established by numerous experiments. And, on May 15, the Professor reported that for ten months his Infusoria had kept alive, without any supply of water. Subsequently the Professor has exhibited samples of the earth to the British Association, at their late meeting at Newcastle, as noticed elsewhere.—(*See page* 165.)

Professor Hausmann has likewise communicated to the Royal Society of Sciences of Göttingen, a notice of this discovery, which he considers to be "undoubtedly among the most remarkable facts lately added to the science of geognosy." This paper, to be found in Jameson's *Journal*, No. 50, concludes with these apposite reflections:—"That a mass more than twenty feet in thickness should consist almost entirely of the coverings of animals which are invisible to the naked eye, and which can only be recognised with the assistance of a high magnifying power, is an extraordinary fact, and one which the mind cannot fully comprehend without some difficulty. The farther we attempt to pursue the subject, the more we are astonished. That which occurs in an invisible condition in the fluid element, and which cannot be recognised by the human senses without the assistance of art, becomes, by immense accumulation and solidification, one of the circle of phenomena which are witnessed by us in the ordinary way; a compact mass is formed, which can be weighed, felt, and seen; and this mass is presented to us in such quantity, that, when regarded only in *one* direction, it surpasses by three times the height of the human figure. Who could venture to calculate the number of infusory animals which would be required to produce even one cubic inch of this mass? And who could venture to determine the number of centuries during which the accumulation of a bed of twenty feet in thickness was taking place? And yet this mass is only

the product of yesterday, compared with the more compact siliceous masses for which the infusoria of a destroyed creation afforded materials. But, what would become of that loose, light silica,—which, by its great porosity and power of absorbing water in quantity, in some measure indicates its origin,—if, instead of being covered by soil one foot and a half in thickness, it had been covered by a great mass of earth or rock, or if another power, such as the action of fire, had caused its solidification? In that case, we should have had no bed twenty feet in thickness, but should, perhaps, have found a compact stony mass, capable of scratching glass, affording sparks with steel, and polishable;—a substance which, were it not for the abundant evidence furnished by the discoveries of Ehrenberg, it would be still more difficult to suppose had resulted from the coverings of invisible animals. Such a consolidation and hardening of this loose silica might, perhaps, be partly accomplished in another way, by making the experiment of employing it for the manufacture of glass, or as one of the ingredients in porcelain; by which means a discovery, so very remarkable in a natural-historical point of view, might, at the same time, become of practical importance. *Glass formed from the coverings of infusory animals!* Who would a few years ago have believed in the possibility?"

A portion of these Infusoria (*Bacillariæ*,) having been forwarded to the United States, led Professor J. W. Bailey to search for the living species of this family at West Point, N. Y. They were soon found in abundance, not only in small streams and stagnant pools, but also nestling in the wet moss on moist rocks. They were, however, found most abundant in bunches of *Conferva*, *Zygnema*, and *Batrachospernum*, which constitute the green slimy " Frog-spittle." They were accompanied by great numbers of the *Diatomæ*, particularly *Diatoma flocculosum* and *Fragillaria pectinalis*. By burning off the vegetable matter from a bunch of the *Conferva*, and examining the ashes with a good microscope, the Professor found them chiefly composed of the siliceous shells of various loricated Infusoria; and the *Diatomæ* were found unchangeable by fire or acids, and consequently, like the Bacillariæ, composed of silica.

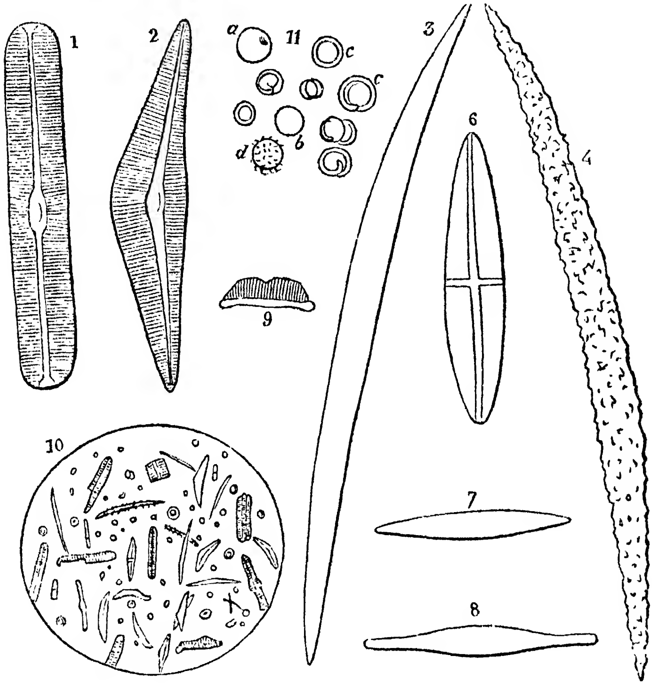
Professor Bailey next searched the mud at the bottoms of the bogs, streams, &c., where the living specimens occurred, and soon discovered a deposit eight or ten inches thick, and probably several hundred yards square in extent, which was wholly made up of the siliceous shells of the Bacillariæ, &c., in a fossil state. This deposit was about a foot below the surface of a small peat-bog; it was a white or clay-coloured substance, which, when examined closely in the sunshine, shewed minute glittering linear particles; and beneath a good microscope this was found to be almost entirely composed of fossil Infusoria, with occasionally a few fragments of a Diatoma or Fragillaria.

From the white colour of this substance, it may in some cases have been confounded with marl, from which its action with acids would distinguish it. To examine for the Infusoria, diffuse a small portion in a drop of water, and examine with a microscope of high power.

Professor Bailey adds nothing new to the testimony of those who support the animal nature of the Bacillariæ: he has often witnessed the motions of several species, and would no more think of referring them to the action of electricity, than he would the more active, but apparently not more voluntary, movements of Vibrio, or Rotataria. He has seen them advance and recede, vibrate to the right and left, push against obstacles, and, in case they could not pass them, retreat and go

round them. It must be a very curious electric arrangement that can produce such actions as these.

These details have been condensed from Silliman's *Journal*, No. 71: received Dec. 1838.



(Infusoria, found at New York: 10, Peat-earth in a drop of water.)

Explanation of the Engravings.

Fig. 1. One of the fossil Infusoria found at West Point, which appears identical with specimens from Ehrenberg.

Fig. 2. Another species, which is also very abundant in the peat-earth. The fine parallel transverse lines are markings upon the shell, which are easily seen with a high magnifying power. The figures represent these objects as magnified about 350 times in length.

Fig. 3. A smooth round siliceous body, apparently solid, and without any marks. Very abundant in the peat-earth.

Fig. 4. A round solid siliceous body, having numerous asperities. Less abundant than the preceding.

Fig. 5. Siliceous shell of a common species of Infusoria.

Figs. 7, 8, 9. Siliceous shells of small Infusoria. The motions of the living species of Figs. 7 and 8 are more active than any of this tribe. The motions of the species represented by Fig. 5 are also very evident.

Fig. 10. A portion of peat-earth diffused in a drop of water, and moderately magnified (about fifty times). This shews imperfectly the immense number and variety of forms which exist in the peat-earth.

The Stonesfield Fossils.—The fossil jaws of the *Thylacotherium Prevostii* (Valenciennes), found in the Stonesfield slate, have lately excited renewed interest, in consequence of the discussions which have taken place at the meetings of the Institute of Paris, respecting the class of animals to which they ought to be assigned. Cuvier, many years before his death, pronounced that the specimens he examined belonged to the *Marsupialia;* but, as the Stonesfield slate occurs far down in the secondary series of formations, the existence of that order of quadrupeds in so old a rock has constantly been regarded with a jealous eye by those naturalists who have doubted the possible existence of *mammalia* at so remote a period in the geological history of our globe. In France, the controversy lies between M. de Blainville and M. Valenciennes; and, in this country, the subject has been ably treated by Professor Owen, in two papers read to the Geological Society, on Nov. 21, and Dec. 19. Mr. Owen has inspected the specimens themselves, whilst M. de Blainville has only examined the casts. M. Valenciennes strongly supports the opinion held by Cuvier. Mr. Ogilby, however, considers that we are not justified at present in pronouncing to which class the fossils belong. The subject being one of controversy, is scarcely fitted for our pages; so that the reader is referred for the papers of Messrs. Owen and Ogilby to the *Athenæum,* Nos. 579 and 583. M. de Blainville's paper has been translated in the *Magazine of Natural History,* No. 24; and that of M. Valenciennes in No. 25 of that excellent journal. The subject is altogether rife with interest for the geological inquirer.

The Toxodon Platensis.—This gigantic quadruped, referred to in a preceding abstract (page 221) is thus described by Professor Owen, in the large work illustrative of the *Zoology of the Voyage of the Beagle,* now publishing.

The cranium of the quadruped was discovered in the Sarondis, a small stream entering the Rio Negro, about 120 miles N.W. of Monte Video, while an under jaw was procured at Bahia Blanca. The name of *Toxodon Platensis* has been applied to this singular animal, the first or generic term relating to the curved form of its teeth, the latter indicating the locality of its discovery. The skull is in length two feet four inches, in breadth one foot four inches. The teeth consist of molars and incisors, separated by a long diastema, or toothless space; in the upper jaw the former are fourteen in number, seven on each side; the incisors four, one very large and one small, in each maxillary bone; but although the dentary system is decidedly rodent, yet the number of the molar teeth, and their diminution of size as they advance towards the anterior part of the jaw, indicate an approach to the *Pachydermata;* at the same time it is observed, the *Capybara,* in the increased size of the posterior grinders and other parlicularities, presents a somewhat similar alliance to the same tribe. The depth of the zygoma bespeaks the size of the masticatory muscles; and the temporal muscles being also large, it is presumed that the great incisors at the extremity of the jaws were used, like the canines of the hippopotamus, to divide or tear up the roots of aquatic plants. The osseous parts pertaining to the senses of sight and hearing resemble those of the aquatic *Rodentia* and *Pachydermata.* The aspect of the nostrils is placed upwards, as in the herbivorous *Cetacea;* but in the bony structure they individually differ by having narrow canals of intercommunication between the nasal passages and the frontal sinus. The articulating condyles of the cranium indicate, that

when the body of the Toxodon was submerged, the head could be raised so as to form an angle with the neck, and bring the snout to the surface of the water, without the necessity of any corresponding inflexion of the spine. There is no evidence to determine the character of the extremities, whether they were ungulate or unguiculate; while the structure of the nostrils will suggest that the habits of the animal were not so strictly aquatic, as to warrant the supposition that the under extremities were altogether wanting. On the whole, the discovery of these remains is one of the most important which has been made for a long period.

The description of the next extinct fossil animal is a very beautiful piece of investigation, and proves the singular address and skill of the author; for, furnished only with a few bones of the trunk and extremities, without a fragment of tooth, or of cranium, to serve as a guide to the animal's position in the zoological scale, he has been able to refer it to its place in the system. (*Jameson.*)

New Fossil Wax.—Professor Johnston, of the University of Durham, describes, in the *Philosophical Magazine*, a fossil body, possessing many of the properties of Hatchetine, and much resembling the fossil wax of Moldavia, to which the name of Ozocerite has been given. This new substance was found near Newcastle-upon-Tyne, in driving through a *trouble*, in Urpeth colliery, at a depth of about sixty fathoms from the surface, sometimes in cavities near the sides of the trouble, and sometimes in the solid sand-stone rock. It occurred in considerable quantity, and was sufficiently soft to be made into balls by the workmen.

The author, by several ingenious experiments, proves the identity of the substance from Urpeth with the Ozocerite of Moldavia, and shews their elementary composition to be the same as that of olefiant gas. The ozocerite found in Urpeth colliery must have had its origin in the coal strata. "Emitted in the form of vapour, and carried along by the lighter gas (fire-damp), given off at the same time, it would pass through the trouble, on its way to the surface, and be partly condensed in the cavities and other cool places it came in contact with. It is highly probable that the other varieties of fossil wax may have been derived from a similar source."

The Ozocerite of Moldavia is of a brown colour, of various shades, has the consistency and translucency of wax, a weak bituminous odour, sometimes a foliated structure and conchoidal fracture, and can be reduced to powder in a mortar. In burning, it emits a considerable light, and is stated to be used for the manufacture of candles. Professor Graham has in his possession a candle formed of a substance found in the coal mines near Linlithgow, in Scotland; which, in every respect, resembles the Ozocerite candles of Moldavia.

Professor Johnston considers these substances to be products of the distillation of coal. Reichenbach states that bituminous coal, by distillation with water, yields 1,320,000th of an æthereal oil, which is identical with native naphtha; and he concludes that the naphtha and petroleum springs of Persia, India, Italy, and South America, have their origin in the slow distillation of large beds of coal, by the ordinary heat of the earth. The fossil wax of Moldavia, and the Hatchetine of England are, probably, derived from vegetable matter by a like agency.—*See Philos. Mag.* No. 76.

New Trilobite.—The outline of this fossil, (*Calymene Rowii*, Green,) as it lies upon the rock, presents a very regular oval figure. The buckler

and body are a good deal elongated, and measure longitudinally nearly an inch and two-thirds.

The buckler is lunate, and is edged with a little groove or channel. Its front, or middle lobe, is elevated above the cheeks, is rounded at its anterior part, and gradually enlarges as it approaches the middle lobe of the abdomen. There are no tubercles or folds upon it, but its posterior angles are so truncated as to form a subtriangular protuberance on each side of the commencement of the vertebral column. The cheeks are shaped like spherical triangles, and seem to have projected on each side to the fourth articulation of the abdomen. The oculiferous tubercles are large and lunate; they are placed close to the front, seem almost to form a part of it, and are situated just before the protuberance above mentioned. The abdomen and tail can readily be distinguished. There are twenty-three articulations in both. The middle lobe is very prominent.

This beautiful trilobite was found by Mr. G. L. Le Row, of Poughkeepsie, N.Y., in compliment to whom it is named. It occurred in a layer of soft argillite, slightly ferruginous, and of such is the fossil composed. The stratum in which it was found was filled with *Orthoceræ* and numerous other fossils. Immediately under this layer is another of argillite, of harder texture and darker colour, and free from petrifactions.—*Dr. Green; in Silliman's Journal.*

Argonauta.—M. Sismonda, jun., of Turin, has discovered near Coningliano, in the blue marls of the super-cretaceous deposit, the *Argonauta Argo*, Linn., a genus which does not appear to have been hitherto found in a fossil state.—*An. Nat. Hist.*

Age of Bats.—M. de Blainville has presented to the French Academy of Sciences, an interesting memoir on the Classification and Antiquity of Bats, (*Cheiroptera,*) in which he thus sums up our present knowledge of their fossil remains:—1st, that they existed before the formation of the tertiary strata of northern countries, as they are found in the gypsum of the neighbourhood of Paris; 2nd, that these *Cheiroptera* were, very probably, contemporary with the *Anoplotherium*, and *Palæotherium*; 3rd, that they have continued to exist from that time to the present without interruption, as they are found in the diluvium of caverns, and in osseous breccia; 4th, that the ancient *Cheiroptera* differed but little from the species now inhabiting the same countries.

Footsteps on Sand-stone, near Liverpool.—This interesting discovery was made in a quarry on the summit of a peninsula between the Dee and Mersey, at a considerable depth from the surface, by two intelligent persons connected with the quarry; and, an account of the circumstances, drawn up by Mr. Cunningham, the eminent architect, has been read to the British Association, by Professor Buckland. The specimens found were casts of the impression of the foot, with the forms of the nails as perfect as if they had been moulded in wax. There are two sets of footsteps; one set being those of an animal, of which traces have been before observed, and which has been called *Cheirotherium*, from its hand-like foot: the other, those of smaller animals, which seem to have been land tortoises, similar to those which have been long known in the Dumfries quarries, and which are fully described in Dr. Buckland's *Bridgewater Treatise*. A space of between twenty and thirty feet horizontal, is exposed in the quarry on which these footsteps are distinctly seen, and where the animals do not ap-

pear to have been walking in the ordinary way, but to have been performing gambols. The slabs are now in the Museum of the Natural History Society, at Liverpool, with a series of slabs twenty-one feet in length, filled with these prints: the impression of the foot is like such a mark as a man would make with his thumb and finger in forming a bridge with his hand in playing at billiards. The hind-foot is double the size of the fore-foot. Precisely similar footsteps were found at Hiderberghausen, in Saxony, three years ago; they have also been found in Dumfriesshire.

Dr. Buckland likewise mentioned that at Liverpool had been discovered the impression of a fossil shower of rain upon sand-stone: it could not be mistaken for the ripple of water—that was common enough: it had all the small-pox character, the pitted appearance, which a heavy shower of rain would leave, and which would be covered up by the next tide, and so preserved to future generations.—*Athenæum and Literary Gazette.*

The Mammoth.—An entire skeleton of the Mammoth, (*Megatherium,*) found in a cavern of the island of Podresa, near Novaïa Zemlïa, has been added to the Museum of the Jardin des Plantes, at Paris.

Ichthyosauri.—A discussion has taken place before the Geological Society, relative to a remarkable description of the tails of the Ichthyosauri, always found broken at a particular vertebra. It was agreed by Professor Owen that, not improbably, a fin, analogous to that of many *Cetacea,* had existed in the recent animal; for, no indication of such an appendage was visible in the osteological structure of the *Cetacea,* whence, had we been acquainted only with the skeletons of those animals, as in the instance of the *Ichthyosauri,* the former presence of so highly important a locomotive organ would certainly never have been suspected. He was led to surmise, therefore, in order to account for this constant disrupture of the caudal vertebræ of these animals always at one place, and from the appearance which the discontinuation presented, that a weighty appendage must have broken down the vertebral column, when, the dead animal having floated on the surface until decomposition had loosened the attachment of its bones, and its investments having been sufficiently coherent to have confined the gases disengaged by putrefaction for the required period, it at length sunk on the bursting of the skin; and an argument was accordingly deduced from this presumed circumstance, for the tranquillity of the waters at the time this gradual process was going on.—*Analyst.*

Plesiosaurus Macrocephalus.—On April 4, was read to the Geological Society, "A Description of Lord Cole's Specimen of *Plesiosaurus Macrocephalus,*" by Prof. Owen. From a minute examination of the structure of the head, Mr. Owen has ascertained that the *Plesiosaurus* has a greater affinity, in the cranium, to the *Lacertine saurians* than to the *Crocodilian;* but that in the facial and maxillary bones the agreement with the former begins to diminish, while in the size and position of the nostrils, we have one of those beautiful examples of adaptation of peculiar structure to the peculiar exigencies of the animal, which surpass all the restraints of a limited system of analysis and type.

Spirolinites.—On June 6, was read to the Geological Society, " An Account of Spirolinites in Chalk and Chalk-flints," by the Marquess of Northampton, F.G.S. These microscopic fossils were found by the author principally in Sussex, and in some localities in great abundance, accom-

panied by innumerable minute fragments of small corals and other organic bodies. They occur more frequently in the gray than black flints; but in nearly every instance the shelly matter of the spirolinite is of a lighter colour than the ground of the flint, or the filling up of the chambers. The fossil is seldom procured perfect, the prolonged or straight portion being generally detached from the spiral. One perfect specimen obtained in France, measured about a third of an inch in length. Though it is extremely difficult to determine specific differences in minute fossils, seldom exposed but by accidental fracture in a flint, yet the paper contained a list of six species, one of which Mr. Mantell had previously called *Spirolinites Comptonii;* and the other five the Marquess of Northampton has distinguished by the names of *S. Bucklandii, S. Murchisonii, S. Stokesii, S. Mantelli,* and *S. Lyelli.* It was also mentioned, that Mr. Walter Mantell, and the Rev. Gerard Smith, had found considerable numbers of spirolinites in Sussex.—*Literary Gazette.*

Fishes in the Bagshot Sands.—Dr. Buckland has read to the Geological Society the details of the discovery of Fossil Fishes in the Bagshot Sands at Goldworth Hill, four miles north of Guildford. These remains were discovered in cutting through the summit of the hill, on the line of the London and Southampton Railway. They consist of the teeth of sharks, the palates and teeth of rays, a large tooth of a saw-fish, the remains of three cartilaginous and a few vertebræ of bony fishes; also palatal teeth of three genera, two of which offer combinations of characters of both these divisions. In the stratum which contained these remains there were likewise found portions of the carapace of an emys, resembling the species found in the London clay; and Sir Philip Egerton possesses a fragment of a tooth from Sheppey, of one of the new genera found at Goldworth Hill. From the agreement, therefore, in the fossils of these localities, Dr. Buckland stated, that Mr. Lyell's opinion relative to the Bagshot Sand being an eocene deposit, had received additional support.—*Proceedings of the Geological Society.*

Vegetables.—Some years back (1822) M. Adolphe Brongniart pointed out certain affinities which appeared to him to exist between the fossil trees named by him *Sagenaria* and the *Lycopodiaceæ.* A further study of *Lycopodiaceæ* and the fossil genus *Lepidodendron* confirms him in his previous views. The characters of vascular Cryptogamia, according to M. Brongniart, are,—1st, the absence of axillary buds, and the division of the stem by terminal dichotomy; and 2ndly, the total absence of growth with regard to diameter, and of all organic changes in the stem, let the age be what it may. The *Lepidodendron,* in its gigantic size, not only presents all these characters but even the peculiarities of the humbler *Lycopodiaceæ,* and particularly the section called *Selago,* which only differ in dimensions; he even refers the *Lepidodendron Harcourtii* to the genus *Psilotum.* Further researches have brought to light the fructification of the *Lepidodendron,* also resembling the living family above mentioned; and therefore M. Brongniart proposes to erect this fossil plant into a distinct genus of *Lycopodiaceæ.*—*Athenæum.*

Trees.—On May 9, was read to the Geological Society, "An Account of the Fossil Stem of a Tree lately discovered in the Coal Measures near Bolton-le-Moor," by Dr. Black, F.G.S. This fossil, when first exposed in the quarry, was about thirty feet long, but when it was examined by Dr. Black, only twelve feet remained *in situ,* the thicker end of which was

about fifteen inches in diameter; and the thinner end nine inches. It traversed three strata, and was inclined at an angle of 18° to the N.E., the strata dipping from 12° to 15° to the S.W., or in an opposite direction. The interior of the stem consisted of a finely grained sandstone, mixed with carbonaceous matter, clay, and oxide of iron; and the surface was singularly striated and furrowed, as if from contraction or pressure, and was generally coated with a layer of coal. Along the whole length of the fossil was attached, and in some places apparently imbedded in the bark, a *Sternbergia*, about an inch in diameter. The allocation of these two plants formed the principal object of Dr. Black's communication; and he has been induced to infer, from the condition of the fossils, that the *Sternbergia* was not accidentally placed in juxtaposition with the larger stem, but that it was originally a parasite, resembling, in this respect, the mighty creepers of tropical regions.—*Lit. Gaz.*

At Gilsland Spa, near the Carlisle and Newcastle Railway, has been discovered an immense fossil tree, which must have been twelve or thirteen feet in diameter: the bark has, by the tendency of the bituminous particles to it, been converted into coal, while the branches have become sandstone, affording, in the discoverer's opinion, (Mr. Rooke, author of *Geology as a Science*,) an important illustration of his theory, that coal is the produce of drifted wood.—*Railway Magazine.*

Isle of Wight.—On Nov. 5, Professor Owen read to the Geological Society, a paper "On some fossil remains of *Chœroptamus*, *Anoplotherium*, and *Palæotherium*, obtained from the Freshwater deposit in the Isle of Wight, by the Rev. W. D. Fox." The existence of the *Anoplotherium* and the *Palæotherium* in the quarries of Binstead, was long since proved by the discoveries of Mr. Allan and Mr. Pratt; but the collection recently made by Mr. Fox, has enabled Professor Owen to determine fully several of the species found in the gypsum quarries of Montmartre; and to show that the *Chœropotamus*, another of the Paris basin genera established by Cuvier, and placed among the *Pachydermata*, nearest to the *Peccari*, occurs also in the Isle of Wight. The portion of this curious animal described by Mr. Owen, consists of a nearly perfect right ramus of the lower jaw, about eight eight-tenths of an inch in length. It contains three tuberculated true molars, two perfect conical or spurious molars with the socket of the third, and part of what has been considered a canine tooth. Professor Owen then observed, the occasional carnivorous propensities of the common hog are well known, and they correspond with the organization of the genus which offers the nearest resemblance among the existing *Pachyderma* to the carnivorous type of structure.—*Abridged from the Athenæum.*

AGE OF FOSSILS.

On May 9, Mr. Smee read to the Geological Society, an interesting paper upon the change which animal matter undergoes in the process of becoming fossilized. In this it was clearly shewn, from a variety of direct observations made upon human bones that had been inhumed for a shorter or longer period, (and of which the most ancient had been obtained when digging for the foundation of the cathedral of Old Sarum,) together with those of different animals, of various degrees of Geological antiquity and of petrefaction, also from carefully conducted experiments upon shells and other animal exuviæ, that the carbonization of the animal (as distinguished from the earthy,) matter which they contain, is super-

induced from putrefaction, and accordingly, affords no datum for determining the relative age of fossils.—*Analyst.*

STRUCTURE OF FOSSIL TEETH.

PROF. OWEN has read to the British Association, a paper on this interesting inquiry, in which the curious modifications which this structure undergoes in the Megatherium, the Ichthyosaurus, and fossil fishes, were illustrated. Mr. Owen has examined sixty classes, mammalia, reptiles, and fishes; and he has found, on comparing their structure with the teeth of man, that they all differ. It would be impossible to give the details, but the general result of the investigations is a most important one to geologists, namely, that the different genera may be distinguished by the internal structure of their teeth alone; and, therefore, when other characters fail, or a complete tooth is unattainable, generic, nay, perhaps even specific, identity, may be established by merely obtaining a thin slice of one of these fossil teeth.—*Athenæum.*

HIGHGATE RESIN.

A LARGE round, and rather flat specimen of the resin obtained from the excavations of the London and Birmingham railway, near Chalk Farm, has been found, on examination, to be very much impregnated with the sulphuret of iron. After exposure to the air for a short time, the mass separated into several fragments, exhibiting rounded cavities filled with solid iron pyrites, as if it had passed into the substance of the resin in a fluid state. The portion of the resin in immediate contact with the pyrites was unchanged.

In another specimen discovered on breaking a Septarium from the Highgate Archway, vegetable remains were quite close to the resin: this is an interesting fact, tending to shew, that like amber, the resin, probably, had its origin in vegetable juices. Remains of insects have not been met with. Like other resins this is electric, although in a less degree than amber.

Several London clay shells have also been collected here, and among them an unfigured volute closely resembling the *Voluta Lamberti* of the crag, but having a longer spire, and being more oval. Mr. J. D. Sowerby has named it *Voluta Wetherellii.*—*Mag. Nat. Hist.*

MUMMY IN A PEAT MOSS.

AMONG the curiosities lately added to the Museum of the Royal Society of Northern Antiquities at Copenhagen, there is one of a singular nature and great historical interest. It is the mummy of a female, found in a peat bog near Haraldskioer, in Jutland, completely sunk in the soft ground, and fastened to a stake by means of clamps and hooks. The fragments of clothing that remained on the mummy enabled the skilful antiquaries of the north to conclude, with tolerable certainty, that it belongs to the last period of paganism; and M. Peterson has endeavoured, in an able historical essay, to prove that the mummy is the body of Gunnhilda, Queen of Norway, whom King Harald Blaatand enticed, by promise of marriage, to come to Denmark in 965, when he put her to death by sinking her in a bog.—*Athenæum.*

COAL IN ASIA.

THE Secretary of the Committee for investigating the mineral wealth of India, has ascertained the capability of supplying coal from three or

four known coal-seams connected with the great Burdwan basin; the quality being very superior. Another promising site for coal is at Chilmari, on the western face of the Garrow Hills. The whole of the Assam valley, it is expected, will yield coal. On the Nerbudda, Major Ouseley has ascertained the sites of several deposits; but the navigation of the river does not yet admit of transport.—*Oriental Herald.*

THE NEWCASTLE COAL-FIELD.

Among the more important geological papers presented to the late meeting of the British Association, was a valuable communication "On the Newcastle coal-field," by Mr. John Buddle. This coal-field occupies a tract in the counties of Northumberland and Durham, of about 700 square miles, the limits of which were accurately marked on a geological map of the district. Within this tract all the strata that compose the coal series may be traced continuously. The lowest bed in the series, that, namely, which lies next the millstone grit, is the Brockwell seam. There is, indeed, another seam of coal, called the eight-inch seam, at a perpendicular depth of 97½ fathoms below the Brockwell seam, but separated from it by the entire mass of the millstone grit, and the upper bed of carboniferous limestone. Of the details of this paper, our limits will scarcely allow even an outline. It was illustrated in every part by a profusion of accurate and highly-finished drawings, plans, and sections.

Professor Phillips bore testimony to the importance of this paper, and on the fact now placed beyond a doubt, that the true coal strata extended beneath the magnesian limestone series; he stated that some of the best coal taken to London was found beneath that deposit. He also remarked that the other coal-fields, both of England and Scotland, shewed a perfect accordance with the Newcastle field in respect of the amount and thickness of the beds, the average total thickness of the coal-seams being about fifty feet, including the interstratified matters, while the whole number of beds, 283 to 260 fathoms, shewed an average thickness of about five feet.

Dr. Buckland al-o adverted to the great value of Mr. Buddle's paper. This coal-field is unquestionably the most important in the country, since the metropolis itself, and nearly half the country, may be said to depend almost entirely on it. He thought that we could not over-estimate the importance to succeeding ages, of having a complete and accurate record thus made of all the beds of coal and the various workings—in fact, of a perfect plan of this great subterranean region, such as Mr. Buddle had given; since it would serve as a guide in after generations for every mining enterprise, and might be the means of saving, not only much property, but even the lives of multitudes, who, without such knowledge, might venture amid all the uncertainty and danger of concealed lakes and labyrinths. Professor Sedgwick fully concurred in what had fallen from Dr. Buckland. Mr. James Bryce observed that a great many calculations had been made at different times respecting the duration of the coal-seams of the Newcastle field; that conclusions differing widely from one another had been arrived at; and he wished to ask Mr. Buddle, as the person best qualified to judge. his opinion upon this important point. In reply, Mr. Buddle stated that he would now give the same answer which he had made to a committee of the House of Lords, when asked the same question:—no calculation could come at all near the truth—it must be a mere rude guess. The problem was so complicated, that he never had undertaken its solution.

THE SOUTH STAFFORDSHIRE COAL-FIELD.

Mr. W. Hawkes Smith, in a lecture recently delivered at Birmingham, offered some calculation on the state of the mines of this field: "inferring from the immense quantities consumed—probably, not less than the entire produce of an acre per week in the mining and iron works alone;—from the separated position and inconsiderable thickness of the 'ten-yard' measures in certain situations, and from the problematical result of the bold experiments now carrying on by Lord Dartmouth, at Westbromwich, that the coal-basin is in reality circumscribed, and its contents not so inexhaustible as some writers have deemed it to be, or as, from the present unrestricted, perhaps wasteful, consumption of an unrenewable store, would seem to be expected."—*Analyst.*

DISCOVERY OF COAL.

A valuable mine of fine sea-coal has been discovered at Glen Crossack, in the Isle of Man, and is now being profitably worked.

A seam of fine coal, more than six feet thick, has been found at a comparatively small distance from the surface, in the Forest of Dean.

ECONOMY OF SMALL COAL.

Dr. Buckland has read to the British Association a paper "On the application of Small Coal to Economical Purposes." He referred to the well-known enormous annual waste of coal at the mouths of the various pits near Newcastle; and stated that Mr. Oram had succeeded in agglutinating the small particles of coal into a firm mass by mixing it with refuse tar and other substances, and casting it into bricks. There would be even an economy in using this coal for many purposes, especially for steam-fuel, as it occupied one-third or one-fourth less space, when packed in boxes, than coal in its ordinary state. Dr. Buckland stated, that, by the directions of Government, trials had been made under the inspection of competent persons, and that the combustion was at least as productive as that of coal in its common state.

LIMESTONES OF DEVONSHIRE.

On April 25, a communication was read to the Geological Society, "On the Origin of the Limestones of Devonshire," by Mr. Austen; the object of which was to prove that the beds of limestone in Devonshire are ancient coral reefs, which have been successively formed against the inclined strata of slate and sandstone. That they are, in great measure, composed of the remains of zoophites, the abundance of corals, in many localities, fully attests; and Mr. Austen is of opinion, that he has discovered in these old beds, or banks, of limestone, indications of structure similar to that which has been noticed in the coral reefs of the Pacific. That the calcareous strata were not originally horizontal, and subsequently raised into their present inclined position, he shewed by a section through the parishes of Ogwell, Denbury, and Abbots Kerswell, a distance of more than three miles. All the beds of limestone in this district abound with organic remains of the same description. Supposing therefore, the strata restored to a horizontal position, and the upper beds placed nearly at a level with the surface of the ancient ocean, then the lower beds, the author says, would have been placed at a depth of nearly three miles, although the organic remains prove that all the beds were formed under precisely similar conditions.

Astronomical and Meteorological Phenomena.

"THE HERSCHEL DINNER."

ONE of the most, if not the most, interesting event of the scientific year is the Festival, on Friday, June 15, in honour of Sir John F. W. Herschel, and in commemoration of his return from Southern Africa, after having executed a minute astronomical survey of the southern hemisphere, in accordance with the intention and in furtherance of the design of his illustrious father. Forty-six stewards were appointed, including several noblemen distinguished by their patronage of science, or their connexion with scientific institutions; and his Royal Highness the Duke of Sussex, K.G., P.R.S., took the chair. There were upwards of 400 noblemen and gentlemen present, including a large proportion of the most eminent cultivators of science, in all its departments, and of literature and the fine arts, from all parts of the kingdom; their distinguished guest, Sir John Herschel, being seated on the right of the president. After dinner, his Royal Highness addressed the company, and presented Sir John Herschel with a vase of silver, which had been purchased by the subscription of the friends of science, and contained several sheets of paper bearing the autograph signatures of the persons present. Sir John returned thanks. The vase is a splendid copy of the Warwick vase, in silver, placed upon a pedestal of black marble, on each side of which is an inscription in silver relief; the principal one from the pen of H. Gally Knight, Esq. M.P., being as follows:—

"Herschel *juniori* ab Afris reduci
Cœlis australibus exploratis."

The Festival is characterised in the *Philosophical Magazine*, (whence these details are abridged,) as "one of the most interesting and successful meetings ever held to promote the triumphs of intellect and social virtue."

The sum of £1,000, placed by the Duke of Northumberland at the disposal of Sir John Herschel, for carrying on the astronomical observations at the Cape, not being required by that distinguished astronomer, (he having employed his own instruments, and acted at his own personal expense,) is now to be appropriated to the publication of his work on the subject.

SIR WILLIAM HERSCHEL'S FORTY FEET REFLECTOR TELESCOPE.

As considerable error has long prevailed concerning the celebrated telescope constructed by "the good old Herschel," Sir James South has communicated the following corrective details to the *Times*:—

"The large telescope was forty feet focal length, and four feet aperture. George III., at an expense of £5,000, caused it to be made by the head, hands, and tools, of Sir W. Herschel. The first was clear enough, the second were somewhat *en amateur*, whilst the last were very humble.

"To guard against the mirror breaking during the process of turning in the lathe he was compelled to use a larger proportion of copper in its formation than was otherwise justifiable; hence the mirror soon became the prey of tarnish, and in that state reflected comparatively but a small portion of the incident rays; and to such extent did this occur, that, nearly twenty years ago, when Sir William shewed them to me, they were nearly the colour of mahogany.

"It has been inferred that the George the Third telescope was in a state fit for use at Sir W. Herschel's death. The fact is otherwise."

HALLEY'S COMET.

SIR JOHN HERSCHEL has read to the British Association some interesting observations on Halley's Comet, "that triumph of modern calculation." It was perceived by Sir John on January 25, 1834, when it was well defined, having for its centre a small bright disk, and being surrounded by a faint nebula. This nebula, in two or three nights, was absorbed into the disk, and disappeared entirely. Meanwhile, the disk itself dilated with extraordinary rapidity, and by measuring its diameter at every favourable opportunity, and laying down the measures by a projected curve, Sir John found the curve to be very nearly a straight line, indicating uniform rate of increase; and by tracing back this line to its intersection with its axis, Sir John was, led, at the time, to this very singular conclusion—viz. that on the 21st of January, at 2 h. P. M. the disk must have been a point, or ought to have no magnitude at all! in other words, at that precise epoch, some very remarkable change in the physical condition of the comet must have commenced. Sir John Herschel afterwards learned, that Professor Boguslawski, of Breslau, had his telescope directed point-blank on the comet that day, when the only appearance it presented was that of a star of the sixth magnitude—a bright concentrated point, which shewed no disk, with a magnifying power of 140! From this he concluded, that there had been a rapid absorption of nebulæ during its perihelion; and that, on its return from the sun, the nebulæ were precipitated. This would account for his (Sir John's) not seeing it till the 25th, as on the 21st it was only a star, and could not have been recognised by Professor Boguslawski, had his instrument not been previously directed to its exact position by calculation. It was a perfect comet when seen on the 24th by Mr. Maclear; and had it been visible as such, before that time, he, (Sir J. H.,) thought he must have observed it, as he repeatedly swept the heavens in the very direction where it appeared; and must often have swept with a night-glass over the very spot where it stood in the mornings before sunrise. "And never (adds Sir J. H.) was astonishment greater than mine at seeing it riding high in the sky, broadly visible to the naked eye, when pointed out to me by Mr. Maclear, who saw it with no less amazement on the 24th. The next remarkable feature, is the enormously rapid rate of dilatation of the disk and the absorption into it of all trace of the surrounding nebulæ. Another, is the interior cometic nucleus. All these phenomena, while they contradict every other hypothesis that has ever been advanced, so far as I can see, are quite in accordance with a theory on the subject, which I suggested on the occasion of some observations of Biela's

comet,—a theory which sets out from the analogy of the precipitation of mists and dews from a state of transparent vapour on the abstraction of heat. It appears to me, that the nucleus and grosser parts of the comet must have been entirely evaporated during its perihelion, and re-precipitated during its recess from the sun, as it came into a colder region; and that the first moment of this precipitation was precisely that I have pointed out as the limit of the existence of the disk—viz. on the 21st of January, at two P. M. or, perhaps, an hour or two later.—*Literary Gazette; Athenæum.*

ENCKE'S COMET.

ENCKE's Comet, (says M. Arago,) is a vast nebulosity, 64,000 times larger in volume than the earth; yet, such is the tenuity of its substance, that in 1795, Sir William Herschel was able to discern through its mass a star of the twentieth magnitude

On September 21, this comet was detected by Sir James South, and the fact published in the following note to the *Times* journal.

"Observatory, Kensington, Friday, 3 o'clock, A.M.

"Right Ascension about 2 hours, 33 minutes—North Declination about 34 degrees, 57 minutes—in the field of the large Achromatic Telescope, is a Nebuloid Body hitherto undiscovered, or Encke's Comet. It is extremely faint. Its motion, somewhat more than suspected since I detected it, will, I doubt not, enable me very shortly to communicate further on the subject. JAMES SOUTH."

Mr. Glaisher writes, from the Cambridge Observatory:—

"The peculiar clearness of the atmosphere and heavens at the time of the comet's passing the meridian, October 4, 13h. 30m., induced me to look for it, but with little hope of success, the moon having passed but half an hour before and was shining very brightly; the comet was thirty degrees above her; I saw some very faint object which did not appear to be a star, and took an observation of it. I afterwards looked with a five-feet equatorial, the telescope of which is very good, and found some stars which I knew were very near the comet; and, after excluding all possible light from the room, again saw the comet, and watched it till four o'clock, during which time I got three pretty good observations of it, from which it appears that it moved through a minute and a half of declination in one hour—proving, beyond a doubt, that it was the comet; it is a nebuloid, filling a space of about three quarters of a minute, and at the time of observation followed three stars of the seventh or eighth magnitude, in the form of a triangle, about two minutes. It had been looked for very attentively with the twenty-feet telescope on several previous evenings, but at each time the atmosphere was very moist, which, after a short time, diminished the object-glass."—*Cambridge Chronicle.*

On the 26th of October, at midnight, Sir James South saw the comet with the naked eye, although it was then in the Milky Way—in "almost a Moscow sky." In the evening, the comet had been very distinctly seen; its light was considerably condensed towards the centre. It was in a very rich part of the heavens, more than forty stars being in the field with it. Sir James saw it pass over several, and some of the twelfth magnitude were visible through it, even within twenty seconds of its most condensed part.

At nine hours, thirty-five minutes, and thirteen seconds, mean time (at Kensington,) its approximate right ascension was twenty-three hours,

fifty-four minutes, and twenty-seven seconds. Its north declination was about sixty-three degrees, thirty-six minutes, and twenty-six seconds.

An observer, (in the *Times*,) writes from Liverpool, November 10:— "In the past week the comet was tolerably bright, though not so much so as it was in the year 1828, and might extend eight or ten minutes in space at its broadest part. Its form, on November the 5th, 7th, and 8th, was such as might be exhibited by the frustrum or fragment of a parabolic cone cut off internally by an indistinctly traceable hyperbola, something like the shape of a bat's wing gas-light. The outer or convex parabolic line was very well defined, precise at the vertex, and the inner demarkation was moderately distinct also, subject to the shooting of the rays in the direction of the comet's course. One thing was remarkable: the base of the cone preceded the vertex in the movement of the comet, as it passed over the stars which it happened successively to eclipse. On the night of the 8th instant it had a very beautiful appearance. A small and tolerably bright star, having about eighteen hours, sixteen minutes, right ascension, and about forty-seven degrees, thirty minutes, north declination, (not marked on the globes, nor specified in any of the catalogues, but I think given in Bode's map of the circumpolar stars,) between the stars Vega and Etanim, was first seen gently enveloped in the thin nebulosity of the tail, then gradually travelling along the line of the diameter of the cone, until it occupied apparently the precise vertical point of the gleaming curve, forming, as it were, a bright golden nucleus to the small faint silvery meteor in the dark field of the telescope, and finally emerging slowly from it. The instrument used was an achromatic telescope, having an object glass of very fine quality, of five inches in diameter, with a focal distance of seven feet. The eye-pieces used had powers of about 120, 240, and probably 400, for they have not been ascertained exactly. On the nights of November the 5th and 7th, the comet bore the highest power very well, but on the 8th the lower and the middle powers were quite strong enough. The comet shewed no nucleus with the highest power, but was dense towards the apex. It is right to mention that the mounting of the telescope is altogether rude, and that the positions given in the present attempt must be considered merely as approximations."

ECLIPSE OF THE SUN.

PROFESSOR OLMSTED has communicated to Silliman's *Journal*, some observations made at Yale College, U. S., New York, on the Eclipse of the Sun, September 18, 1838. The Professor made use of his large achromatic of ten feet focus, and was accompanied by Messrs. H. L. Smith, and E. P. Mason, the former having a Gregorian of three feet focus, and the latter a Newtonian of seven feet.

For some time previous, the atmosphere was cloudy, with some rain; yet, an hour or two before the eclipse came on, the clouds broke away, and the sky became serene. The observers were great gainers by the previous state of the atmosphere, the sky being washed clean of all vapours, while the sun had not shone long enough to disturb the tranquillity of the medium, by ascending and descending currents. Hence there was a peculiar sharpness in the line presented by the solar disk.

The average of the three observers' notes gave the following results, expressed in mean time.

Beginning of the Eclipse . 3h. 21m. 14.47s.*
End . . . . 5h. 52m. 17s.

* It will be seen that this is 42,47 seconds later than the time given in the American Almanac.

The profile of the moon projected on the sun's disk, as seen through the large reflector, (Clarke's telescope,) with a power of 180, presented a very irregular outline. The mountain in particular, (*Mons. D'Alembert's*) near the centre of the margin, swelled out with striking prominence, having the rounded figure of an obtuse cone.

The darkness was not such as to make any of the stars visible to the naked eye, but a solemn, bronzy veil was thrown over the face of nature. The changes in the barometer and hygrometer were inconsiderable, and the thermometer suffered less reduction than it probably would have done had not the sun a short time previous emerged from a cloudy atmosphere. No change worthy of note was observed in the magnetic intensity.

Mr. Mason had attached to his telescope a divided object-glass micrometer, by means of which he made multiplied observations on the solar cusps; for which see Silliman's *Journal*, No. 71, p. 176.

TOTAL ECLIPSE OF THE SUN.

MR GEORGE INNES has communicated to the Astronomical Society, some observations "On the Total Eclipse of the Sun which will happen July 7, 1842; with the Elements for Calculating from the Solar Tables of Carlini, and the Lunar Tables of Burckhardt. Also, the Result of Calculations for the Observatories of Greenwich and Marseilles." The author remarks that the Great Solar Eclipse of 1842 will excite much interest, as it will be *total* for the southern parts of France, and very large throughout Great Britain, though not total for any place in the island. The elements for calculating the Eclipse are given, and the results of Mr. Innes's calculations for Greenwich and Marseilles, which latter place was selected as being the nearest to Greenwich of the properly fixed points at which accurate observations of the *total eclipse* are likely to be made. —*Proc. Astron. Soc.*

PARALLAX OF THE FIXED STARS.

THE nineteenth century is remarkable for triumphs of science, enterprise, and perseverance, over great and acknowledged difficulties, and for the solution of problems, practical and theoretical, sought in vain, or despaired of in former ages. To the discoveries of the North-west passage, the course of the Niger, the cause of Magnetism, the Mechanism of Light, &c., we have now to add another—the Parallax of the Fixed Stars. This magnificent conquest has been achieved by Professor Bessel, of Königsburg, in a series of observations of the double star, No. 61, in the constellation Cygnus, whose distance he has ascertained to be 660,000 times (in round numbers) the radius of the earth's orbit, or (also in round numbers) 62,700,000,000,000 miles. The details of this important discovery have been communicated by him to Sir John Herschel, Bart., in a letter dated October 28, 1838, which was read to the Astronomical Society on November 9. For this paper see *Philosophical Magazine*, No. 85; and *Athenæum*, No. 578.

SATURN'S SATELLITES AND RING.

UNTIL last June, the existence of seven satellites to this planet has rested on the authority of the elder Herschel. No astronomer besides had seen more than five, so that many astronomers doubted the existence of two of them. It was also considered that the rings about Saturn consisted of two only. At length, on the 29th of May last, the astrono-

mers at the Observatory of the Roman College, saw some other lines concentric with the body of the planet on its ring. For several evenings they could not be seen; but on June 7, they were again seen, and it was clearly ascertained, that, instead of two, there were, at least, four rings. M. Decuppis saw them very distinctly on the 18th of June, and by increasing the power of the telescope, another dark band was discovered, dividing the ring into five. Even traces of a fifth band were perceived, which were also seen again on June 27, and July 10; so that if this be substantiated, the planet will be found to have six rings. The third ring from the planet's body is that which the fifth band divides. The distances approximatively are subjoined from the best micrometrical measures to be made. Owing to the excellence of the telescope, the whole of the seven satellites were seen very distinctly and well defined. Their distances from the planet may be represented by the numbers 1, 2, 4, 8, 16, —, 64, and in these instances they follow a law similar to that of Bode, a space being left between the sixth and seventh satellites, in which there will be, doubtless, hereafter discovered another.

	French leagues.
Equatorial diameter of the planet	28,664
Interval between the planet and internal ring	6,912
Internal diameter of innost ring	42,488
Diameter of first division	45,468
Ditto...... second	49,720
Ditto...... third	52,806?
External diameter of internal ring	54,926
Interval between the two rings	648?
Internal diameter of external ring	56,223
Diameter of fourth division	60,286
External diameter of external ring	63,880
Thickness of this appendage, according to Sir J. Herschel......	36?

Railway Magazine.

ON SOUTHERN HEMISPHERE NEBULÆ.

On August 27, a communication from Sir John Herschel was read to the British Association, entitled "On the reduced Observations which he had made at the Cape of Good Hope, in 1835-6 and 7, on Double Stars and Nebulæ." In this paper, illustrated by drawings, Sir John described the remarkable appearances of the southern heavens, and made striking *vivâ voce* additions to the brief technical notes which belonged to his catalogue of these stars. Some of the nebulæ were of extraordinary forms. In one they looked like bunches of grapes, and, in another, like bees swarming, so that it was impossible to define them. He also mentioned the vivid colours of some of the stars: one, in particular, was a fine blue, approaching to a verditer green. Some were so close as to be inseparable; and others seemed as if they were groups formed by family compact. He expressed a hope, that glasses of higher powers than had hitherto been attained by human art, might hereafter be applied to the examination of these double stars, so as to ascertain their nature and motions, whilst changing their positions in every way, and often so as to occult each other. He noticed generally of their distribution over the heavens, that there were fewer in the southern than in the northern hemisphere, and that in the former they mostly consisted of a larger and smaller star, which raised the question whether the lesser orbs were planetary, or had only a reflected light, like the earth's moon. Again, touching on the singular phenomena presented in the colours of these stars, generally yellow and red, he instanced the planet Mars, in our own system, as

analogous to them, his red aspect being quite different from the yellow radiance, whence he derives his brilliancy. The drawings of the nebulæ fully bore out Sir John's description of their being, like wisps and tails, thrown together over the face of the heavens.—*Literary Gazette.*

NOVEMBER AND AUGUST ASTEROIDS.

THE night of November 12th, being the time for the periodical return of an unusual number of meteors, Mr. R. C. Woods stationed himself at Richmond, Surrey, for the purpose of observing this phenomenon.

In the afternoon of the 12th, the sun sank below thehorizon, so as to predicate a clear night, there being a rich profusion of red, orange, and rosy coloured lines,

The wind blew fresh from N.N.E., and the night was, in consequence, very cold. At 10 hours, 13 minutes, P. M., (clock time,) a meteor without train, fell from the star α Lyra, and took its direction across the Milky Way. At 11 hours, another meteor fell from a star north of the Pleiades. At 11 hours, 48 minutes, a large meteor with train fell from γ Cassiopeia, and crossed the Milky Way at an angle of near 90 degrees.

From twelve o'clock (midnight, 12th) till 3 hours, 25 minutes, on the 13th, nine meteors fell, crossing the galaxy at angles of from 70 to 80 degrees; six were without trains, and three with trains.

At 3 hours, 35 minutes, nothing could exceed the beauty and grandeur of the heavens; from E.N.E. to N. meteors fell like a shower of bombshells in a bombardment, and in such rapid succession as to defy every attempt to watch their particular direction and course among the stars, or to ascertain their number. The whole visible heavens were illuminated by the light such a prodigious number of meteors diffused in their descent towards the earth, and a more beautiful and magnificent sight cannot possibly be conceived. At 3 hours, 55 minutes, the "shower" ceased, and after 4 o'clock all traces of meteors were gone; the stars, however, shone without diminution in number or brightness, and the atmosphere was remarkably clear.

The shower of meteors appeared to take its direction from N.N.E. and N., as if the direction of their trains had been occasioned by the wind, which was blowing fresh from the former point. The total number of meteors could not have fallen short of from 400 to 500, the *maximum* number at 3 hours, 45 minutes. We may therefore conclude the "meteoric shower" was equal in interest to any of a former year.

M. Karl Von Littrow, in a recent *Vienna Official Gazette*, states:—The phenomenon of an extraordinary abundance of falling stars, about the middle of November, has been again observed this year, and in our part of the world more decidedly than ever. On the 10th of November, when we watched from eight in the evening till one in the morning, we counted about nine such stars in an hour, the sky being rather hazy. On the 11th of November, during five hours after six in the evening, the sky being clear, we counted about twenty in an hour, so that the phenomenon was increasing. On the 12th of November, the sky being quite cloudy, no observation of the kind could be made. On the 13th of November, the sky suddenly cleared up half an hour before midnight, and remained perfectly serene till daybreak. During these six hours we noted 1,002 falling stars, of which by far the greater part were of the first magnitude, with a long horn of light, and casting much shade, like the moon. The phenomenon decidedly increased from the beginning of

the observation till about four in the morning, when it seemed to have reached its culminating point; from that time till daybreak, it decreased, as the following shews:—

In the 1 hour of observation there were	32	falling stars.
—— 2	52	——
—— 3	70	——
—— 4	157	——
—— 5	381	——
—— 9	310	——

Unfortunately, the state of the atmosphere on the following night was such, that it did not allow any further observation, so that the duration of this remarkable phenomenon could not be determined. At the beginning of August there was an unusual number of falling stars, though very far from that in November. On the 7th and 8th of August, we counted about six in an hour, on the 9th fifteen, on the 10th sixty, on the 11th and 12th thirty, and on the 18th, all which day it was again cloudy, only ten in an hour; so that the 10th of August must be considered as the day on which the phenomenon was at its height, since it increased till that day, and sensibly decreased afterwards.—*Translated in the Athenæum.*

In Silliman's *Journal*, No. 71, is a report on these phenomena, attested by several observers; and, as a general result, Prof. Silliman considers it evident that the number of these meteors seen in America about the 10th of August, 1838, was from three to eight times beyond the average. The observations on the position of the radiant point of this shower were not altogether satisfactory; nor could it be determined on what day between the 8th and 12th of August the shower arrived at its maximum; and Prof. Silliman observes, "we are probably still unacquainted with all those periods of the year at which shooting stars occur in unusual numbers."

REMARKABLE METEOR.

ON March 17, Mr. John Phillips, being about 200 or 300 yards from Kensington Palace, at about ten minutes before 11 o'clock, observed a very brilliant meteor passing across the northern sky, in a direction descending obliquely from near the extreme star in the tail of the Bear, towards a point in the horizon nearly north. The arc described was at least thirty degrees; the meteor was not seen till its full brilliancy had been obtained; and the whole course must have been forty degrees or more. The length of time occupied in moving thirty degrees was estimated at one second and a half. The magnitude of the meteor was apparently great; its figure globular, with a tail or *train*, the length of which was about twice the diameter of the globe. The globular part had a diameter estimated to be fully five minutes. The gas-lamps on the road were dull compared to its glowing brightness, which Mr. Phillips considers to have equalled that of Jupiter in vividness, while the disk was very much larger. The colour of the light was white in the mass, but, at one edge red, and at the opposite deep blue or purple. It vanished about thirty degrees above the horizon, and left a reddish sparkling trace.—*Philosophical Mag.*

METEORIC IRON IN SOUTH AFRICA.

SIR JAMES ALEXANDER having, during his recent Expedition, found a mass of native iron, on the east bank of the Great Fish River, in South Africa, the same has been submitted to analysis by Sir John Herschel, who has detected therein 4.61 per cent. of nickel on the speci-

men analysed. "Thus," adds Sir John Herschel, "it appears to have equal claim to a meteoric origin with any of those masses of native nickeliferous iron which have been found in different localities, and to which that origin has, without other evidence, been attributed.

"All those specimens, however, have, so far as I know, been insulated single masses. But what constituted the peculiar and important feature of this discovery of Capt. (Sir James) Alexander, is the fact stated by him of the occurrence of masses of this native iron in abundance, scattered over the surface of a considerable tract of country. If a meteoric origin be attributed to all these, a shower of iron must have fallen; and, as we can imagine no cause for the explosion of a mass of iron, and can hardly conceive a force capable of rending into fragments a cold block of this very tenacious material, we must, of necessity, conclude it to have arrived in a state of fusion, and have been scattered around us by the assistance of the air or otherwise, in a melted or, at least, softened state."—*Notice read before the Literary and Scientific Institution of South Africa.*

FALL OF METEORIC STONES IN BRAZIL.

On December 11, 1836, about half-past eleven P. M., with a clear sky and a south-west wind, a meteor of uncommon size and brilliancy appeared over the village of Macao, at the entrance of the river Assu; it immediately burst with a loud crackling noise, and a shower of stones fell within a circle of ten leagues. They came into several houses, and buried themselves some feet deep in the sand, but they did not occasion any further damage than killing and wounding a few oxen. The weight of those picked up varied from one to eighty pounds. Specimens which have been sent to the Parisian Academy are to be analysed by Berthier. —*Comptes Rendus; Philosophical Magazine.*

SURVEY OF THE SURFACE OF THE MOON.

In No. 49 of Jameson's *Journal*, will be found a condensed view of some of the leading sections of the great work on "Selenography," lately published at Berlin, by Wm. Beer and Dr. J. H. Mädler: the abstract being divided as follows:—

1. Physiognomy of the Moon's Surface. 2. Supposititious Architectural Remains in the Moon. 3. Do Rivers occur in the Moon? 4. Lunar Atmosphere. 5. Concerning some observations which appear to indicate the existence of a Lunar Atmosphere. 6. Non-existence in the Moon of Clouds, Seas, &c. 7. Light and Colour of the Moon. 8. Physical Remarks upon the Eclipses of the Moon and of the Sun. 9. On the Effect of the Earth's Light upon the Moon. 10. On the Meteorological Influence of the Moon.

LUNAR RAINBOW.

One of these beautiful phenomena was witnessed on the evening of September 16, and lasted for a considerable time: after it had passed away, it was replaced by a brilliant display of northern lights.—*Literary Gazette.*

LAW OF STORMS.

Colonel Reid, of the Royal Engineers, has published a volume of intense interest upon this important inquiry, in which he gives the following opinion as to a theory upon which the origin of storms may be explained:—

"It is a well-known fact, that some parts of the globe are more subject to storms than others, and I have throughout this investigation felt impressed with the opinion, that the force and frequency of storms may have some connexion with the law of magnetic intensity. The islands of Mauritius and St. Helena are nearly in the same degree of south latitude; yet, at St. Helena, a gale was scarcely ever known, and it is said to be entirely free from actual storms. Those who study Major Sabine's report on the magnetic intensities of the globe, and follow his isodynamic lines, which express unity, will find them opening from each other into the northern part of the South Atlantic, and including a space which thus really appears to be the true Pacific Ocean of the world. Within this space, on Major Sabine's charts, will be found two other lines, marking intensities in decimal parts less than unity; and he states that the intensity at St. Helena, as observed by Capt. Fitzroy, is 0.84, 'the lowest denomination recorded, and the locality of the weakest intensity yet observed on the globe.' When we examine the lines of the greatest intensity, we find them approaching each other in longitude 110° and 260° (100° W.), but in different latitudes: for the line of least intensity does not coincide with the earth's equator. In the Chinese Sea, in longitude of 110° E., it is to the north of the equator, proceeding thence in a direction southward of St. Helena. Of the supposed four magnetic poles, the positions of the two in the northern hemisphere are best ascertained. The meridians which run through these two poles, run also through the Chinese Sea, and near the Caribbean Sea, the localities of typhoons and hurricanes; and Major Sabine's isodynamic lines indicate the magnetic intensities so strongly marked there, that we are led to the belief that *there must be some connexion between the magnetic intensity and the force of storms*. The study of electricity, as connected with the weather, deserves to be renewed. Comparisons may hereafter be made between the electric state within the compass of a great storm and the atmosphere around its verge; and if seamen dare to pass across the smaller gyrating columns, or circles, they may possibly be able, by finding out their electrical state, to explain the cause of their now mysterious action."

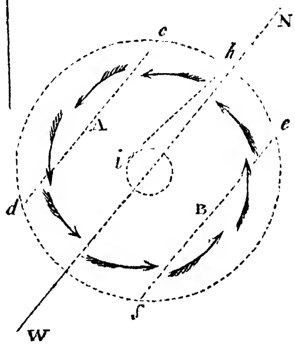
Colonel Reid elsewhere observes: "it is very desirable that the beautiful anemometers of Mr. Whewell and Mr. Osler should be placed beyond our own islands, particularly in the West Indies and at the Cape of Good Hope, where they may measure the force of such a storm as no canvas can withstand—that which reduces a ship to bare poles. It is not only to measure the wind's greatest force that it is desirable to multiply these anemometers, and place them in various localities, but that we may endeavour, by their means, to learn something more definitive regarding the gusts and squalls of wind which always occur in great storms."

Such is the conclusion of a Report read by Colonel Reid to the British Association. "Our readers," reports the *Literary Gazette*, "may form a very familiar idea of the subject by causing water to circulate in a basin, which will represent the violent circular motion of the storm-wind, with a calm in the centre of the vortex. Suppose this to be also moving onward, at no greater rate than about seven miles an hour, and you have the correct notion of the result of Colonel Reid's observation. Near the equator, the law is more constant; but, when a succession of storms reach northern or southern latitudes beyond the tropics, (as where we are placed,) their mixture and interference is the cause of our

variable winds. It is remarkable that waterspouts, in both hemispheres, obey altogether opposite laws, and that their gyrations proceed in directly opposite directions to the gyrations of the storm."

Professor Bache stated that Mr. Epsy, of Philadelphia, held that storms were created by winds blowing into a centre made by the condensation of the atmosphere; and he Mr. Bache had himself surveyed the course of a land tornado, in which all trees, buildings, &c. had fallen inwards, as if this were the true exposition of the phenomenon. Professor Stevelly compared the motion of the aeriel phenomenon to that of water running out of a tub, in the bottom of which a small hole was made. Sir John Herschel observed that a knowledge of the present subject would teach seamen how to steer their ships, and save thousands of lives. Sir John suggested that the gulf-stream might be connected with the theory involved in this investigation; and also that the trade-winds might throw a light upon the phenomena which it presented. He also alluded to the spots observed on the sun, which, by analogy, might bear upon it, as he considered them, without doubt, to be the upper apertures of great hurricanes passing over the disk of that luminary, the atmosphere moving analogously to our trade-winds, and being disturbed by certain causes, precisely as the earth's atmosphere might be.

Annexed is an illustration from a paper by Mr. Redfield,* on this interesting subject. In Purdy's Memoir of the Atlantic Ocean, it is stated, "that while one vessel has been lying to in a heavy gale of wind, another, not more than thirty leagues distant, has, at the very same time, been in another gale equally heavy, and lying to with the wind in an opposite direction."



"This statement is obviously to be understood as applicable to two vessels falling under the two opposite sides or portions of the same storm, where the wind in its regular circuit of rotation must, of course, blow from the opposite quarters of the horizon. We will suppose one of the vessels to be at A, and the other at B, in the annexed figure. The storm in pursuing its course from W. towards N., will strike the first-mentioned vessel in the direction shewn by the wind-arrows at the point *e*, which, if the position be in the temperate latitudes, north of 30° will be from eastward. Now, it is obvious, that as the storm advances in its course north-eastward, this vessel, if nearly stationary, will

* In vol. xviii. of Jameson's Journal, (1835,) was published a short account of Mr. Redfield's "Observations on the Hurricanes and Storms of the West Indies and the Coast of the United States," the Editor being convinced his statements were deserving the particular attention of meteorologists and mariners. It is but lately, however, that his views have been particularly noticed in this country; Mrs. Somerville, Professor Daubeny, and other writers, having mentioned them with approbation.

intersect the body of the gale on the line *c* A *d*. As the storm advances, the wind must also veer to the northward, as shewn by the arrows, being at N.E. when the vessel is brought under the point A, and near the close or departure of the storm by its further progress eastward, the wind will have further veered to the direction shewn at *d*, which, with due allowance for the progressive motion of the storm, we will set down at N.N.W. The other vessel, as is equally obvious, will first take the wind from the southward, as shewn at *e*, in which quarter it will blow, with no great variation, till, by the advance of the storm, the ship is brought under the point B. The barometer, which had previously been falling, will now commence rising, and the wind, veering more westerly, will, at the departure of the storm, be found in the direction shewn at *f*, which, after the allowance already referred to, may be stated at W.N.W. Such, substantially, are the facts commonly reported by vessels which fall under the lateral portions of the Atlantic storms; and it is readily seen, that the opposite winds which are exhibited on the two different intersections of the storm, as above described, will very naturally be mistaken for two separate and distinct gales.

"The phases of the wind in these gales are, however, in all cases modified more or less by the course or changing position of the vessel exposed to its action. For example, a ship on taking the gale, say at E.S.E. at the point *h* on the figure, and lying to with her head to the northward, may, by that means, be brought to intersect the storm on the line *h i*, at the point *i*, would suddenly be taken aback, with the wind, say at N.N.W.; and the barometer which reaches its lowest depression under the central portion of the storm, would about this period be found to have commenced rising with some degree of rapidity.

"A further reference to the figure will shew that a ship, which may be at the point G during the passage of the gale, would be exposed to a heavy swell from the southward and westward; but being beyond the organized limits of the storm, may remain entirely unaffected by the violence of the wind, which at the same time may be raging with destructive fury at the distance of a few leagues. The writer has knowledge of many such examples."

In the *Times*, considerable attention has been paid to an inquiry into this Law of Storms. In the journal of December 28, it is illustratively stated:—"When the *Liverpool* steam-ship was forced back to Cork by foul winds, the *Great Western* had just departed; now if storms be rotatory, the same gale might, of course, blow foul for one, but fair for the other. This appears really to have been the case with regard to these two steam-ships; and the storm they both met appears to have been the same, which raged with much violence here in London on Sunday night, the 28th of October, and on Monday morning. As is not unfrequent before a storm, it was calm at the place of the *Great Western* on the forenoon of the 28th. At noon the wind rose in sudden gusts; but, instead of being a storm from the west, as the *Liverpool* had it, these gusts came first from the southward, and veered violently, though gradually, to the east, and then to the north-east. Next morning the weather moderated with the wind at W.N.W.

"It is supposed that the centre of this hurricane passed over Wales, for the wind was there reported to have changed suddenly from the point from which it had been blowing steadily, without veering to the

point immediately opposite; and such, of course, would be the case if the centre of a whirlwind were to pass over any place. The prosecution of this inquiry may be attended with great importance to shipping."

SHIP STRUCK BY LIGHTNING.

A LETTER from Marseilles, December 23, states: "As the *Rodney* was recently entering Malta, she was struck by lightning, which killed two men and set the ship on fire; but the flames were soon extinguished. The effects of the electric fluid are stated to have been so singular, that Captain Hyde Parker, who commands the ship, is preparing a detailed account of them. The *Rodney* had no conductor.—*Times*.

TIDAL PHENOMENON.

THE *Sandwich Islands Gazette*, of November 18, 1837, gives an account of a remarkable tidal phenomenon, which had just occurred on the shore of the island. "Soon after six o'clock, in the evening, the sea fell very rapidly about eight feet, leaving several vessels aground. The weather was clear and pleasant; thermometer at 74° 5′, barometer 30° 6′; fine breeze from the north-east, squally at intervals. The water, after remaining stationary a few seconds, rose again to the ordinary high-water mark, and at 6h. 40m. again receded four feet six inches perpendicularly, in twenty-seven minutes; it then again rose to the same height as before, and fell again six feet three inches. The third time it rose four inches higher than before. After the fourth, all the ebb and flow, which had hitherto occupied about twenty-eight minutes each, gradually diminished and varied in time, flowing in ten, and ebbing in twenty, minutes. This continued during the night and part of next forenoon. The rapidity with which the water rose and fell varied considerably in different parts of the harbour. At no time did the water rise above high-water mark. Towards midnight the wind subsided, and much rain fell; but there were no unusual atmospheric appearances, or trembling of the earth. The whole commotion appeared to be in the sea. The same phenomenon occurred at the islands in May, 1819, without any earthquake here or at the other islands."

THUNDER AND LIGHTNING.

IT is a curious fact that thunder and lightning are very rare in Egypt, and never known in Lima; nor is there reason to believe in any place in which there is no rain. Neither does it appear that there is any thunder in islands and seas beyond 75° of latitude; and in the open ocean, very far from land, thunder is rarely heard. Storms of thunder and lightning are always more dangerous in cold than in hot months, because in these months the clouds are lower. M. Arago has added to the *Annuaire* of the present year the most elaborate article on this subject that we have yet met with. He states, at the parish of Casena, in Italy, five or six miles in circumference, they have for three years past had raised, at every fifty feet, heaps of straw and light wood, which are set fire to on the approach of a storm; and that during these three years this parish has neither been damaged by lightning, nor has it had hail, though it had suffered every year before by storms, and though during the above three years the neighbouring parishes had suffered much by storms of thunder and lightning. Hence Arago concludes why our mining districts experience less from these storms than our agricultural

districts; that is, on account of the large fires kept up in the former. (*Railway Magazine.*) M. Arago, in his valuable essay, gives a masterly historical sketch of the real facts which have hitherto been accumulated, and from these deduces the inferences, scientific and practical, which may legitimately be drawn. In the general results, as the author anticipated, various truths have been discovered, which the examination of the isolated facts could never have revealed. A translation of this elaborate paper appears (in part,) in Jameson's *Journal, No.* 51.*

DISTANCE OF THUNDER AND LIGHTNING.

THUNDER can scarcely ever be heard more than twenty or thirty miles from the flash which produces it. Lightning, on the other hand, may be seen (or, at the least, its reflection in the clouds, forming what is called "sheet lightning,") at a distance of 150 or 200 miles.—*Sir John*

MAGNETIC FLUID.

DURING a storm at Rochdale, last autumn, a cotton mill was struck by the lightning, and the bell which hung above the roof was destroyed. It was afterwards found that all the tools of a watchmaker residing in the neighbourhood, had become, in a greater or less degree, magnetic, and were wholly useless; they all attracted iron filings readily, and the hammer was polarized, the needle being neutral.—*Correspondent of the Athenæum.*

TREMENDOUS WATERSPOUT.

ON September 12, at about five o'clock, A.M. the village and neighbourhood of Kingscourt, county of Cavan, to the extent of four or five square miles, was visited, for upwards of two hours, by a waterspout, the most destructive witnessed in this part within memory. The village being situated on the side of a mountain, with much difficulty withstood the torrent which rolled from the heights. Corniscea, the seat of Mr. F. Pratt, was so overwhelmed, that twenty men, knee-deep in the water, were required to keep out the flood from the parlour and drawing-room.

SNOW CRYSTALS.

ON February 26, a notice was read to the Royal Irish Academy, on some snow crystals observed at Belfast, on the 14th of January, 1838, by William Thompson and Robert Patterson, esquires. These crystals were observed by the authors among the ordinary snow flakes; and nineteen distinct forms are described. Most of them are identical with those delineated by Hooke, Nettis, and Scoresby; there being, however, some which do not appear to have been before observed. They all belong to the "lamellar," or first of the genera into which they are divided by Scoresby. The size of the crystals generally exceeded considerably that of those observed by the above-mentioned authors; their average diameter being such that the naked eye could readily discriminate the various figures, as they lay on the dark ground. From the great variety of figures observed in the course of a very limited time, (a single hour,) it is inferred by the authors, in opposition to the opinion of

* This No. (January, 1839,) likewise contains the first portion of Professor Bischof's important paper on the Natural History of Volcanoes and Earthquakes, and Arago's eloquent *Eloge* of Joseph Fourier.

Scoresby, that a considerable range of temperature is not essential to the production of very various forms. The weather for some days previous had been frosty, and the barometer gradually falling from about noon on the 12th. On the morning succeeding the day on which the observations were made, there was snow succeeded by showers of sleet; and at noon a heavy rain set in, and continued without intermission the remainder of the day.

MAGNETISM AND THE WIND.

MR. RUSSELL has communicated to the British Association the description of an apparatus for the purpose of shewing the connexion of magnetism with the wind, invented by Mr. Watt, of Laswade. Four small magnets, in a vertical position, were suspended from a horizontal bar, balanced on a steel point and agate cup. This instrument, placed in a glass shade, had been observed with great care by Mr. Watt, and he reports that it had always the same direction as the wind, and that it had also an annual motion like that of the earth.—*Athenæum*.

TEMPERATURE, AND MAGNETIC INTENSITY.

SIR DAVID BREWSTER has called attention to the important fact, clearly established by the meteorological observations recorded in the neighbourhood of New York, and those of Hansteen and Erman, in Siberia, that two points of maximum cold exist in these regions, very generally agreeing in position with the centres of maximum magnetic intensities; and like them, too, the maximum of North America indicate a decidedly higher degree of cold than that which characterises the Siberian pole. Also, that the lines of equal mean temperature, as they surround their poles, have such a relation to the lines of equal magnetic intensity, as to point out clearly some yet unknown connexion between these two classes of phenomena.

AN ELECTRICAL LADY.

A RESPECTABLE physician, in a late number of Silliman's *Journal*, relates the following curious account of an *Electrical Lady*. He states, that on the evening of Jan. 28th, during a somewhat extraordinary display of the northern lights, the person in question became so highly charged with electricity, as to give out vivid electrical sparks from the end of each finger to the face of each of the company present. This did not cease with the heavenly phenomenon, but continued for several months, during which time she was constantly charged, and giving off electrical sparks to every conductor she approached. This was extremely vexatious, as she could not touch the stove, nor any metallic utensils, without first giving off an electrical spark, with the consequent twinge. The state most favourable to this phenomenon was an atmosphere of about 80° Fah., moderate exercise, and social enjoyment. It disappeared in any atmosphere approaching zero, and under the debilitating effects of fear. When seated by the stove, reading, with her feet upon the fender, she gave sparks at the rate of three or four a minute; and under the most favourable circumstances, a spark that could be seen, heard, or felt, passed every second! She could charge others in the same way, when insulated, who could then give sparks to others. To make it satisfactory that her dress did not produce it, it was changed to cotton and woollen, without altering the phenomenon. The lady is about thirty, of sedentary pursuits, and delicate state of health, having

for two years previously, suffered from acute rheumatism and neuralgic affections, with peculiar symptoms.

ATMOSPHERIC CHANGES.

A PAPER has lately been read to the meeting of German naturalists, ld at Freyburg, on a curious discovery by Professor Stiefel,—the result of which has been the attainment of a more accurate knowledge of those changes to which the atmosphere is subjected, than was possible by the old methods. An unerring standard is said to have been supplied in the shape of geranium fruit, the awns of which are *in* and evolved by the dryness or humidity of the atmosphere, in obedience to laws so regular and unvarying, that being fixed on a dial-plate properly graduated, the change from one part of a room to another may be noted with the greatest accuracy.—*Athenæum.*

CONSTITUTION OF THE ATMOSPHERE.

AT the close of a series of ingenious experiments, (as a sequel to an Essay on the above subject, in *Philos. Transact.* for 1826,) Dr. Dalton states as " general conclusions, that the proportion of oxygen to azote in the atmosphere on the surface of the earth is not precisely the same at all places and times; and that in elevated regions the proportion of oxygen to azote is somewhat less than at the surface of the earth, but not nearly so much so as the theory of mixed gases would require; and that the reason for this last must be found in the incessant agitation in the atmosphere from winds, and other causes."—*See Philos. Mag.* No. 76.

CURRENTS IN THE ATMOSPHERE.

ON Nov. 14, Mr. Charles Green, the aeronaut, communicated to the Meteorological Society some observations on the variety of currents in the atmosphere of England. He is of opinion that at a great elevation, the north-west current generally prevails throughout the year, without reference to the direction of the wind near the earth; which constant current is at an elevation of from 13,000 to 14,000 feet. This upper current carries his balloon at the rate of about six miles an hour, whilst the lower current carries it at the rate of thirty miles an hour. He stated that, in one of his ascents from Liverpool, he entered the constant current at an elevation of 14,000 feet, and descended into a lower south-east current at the height of 12,000 feet; the former carrying his balloon at the rate of five miles, and the latter at the rate of eighty miles an hour. The greatest speed he ever travelled was ninety-seven miles in fifty-eight minutes; and his speed has often been from sixty to eighty miles an hour.—*Times.*

VARIATIONS IN THE LOWER ATMOSPHERE.

LAST winter a great number of trees in the neighbourhood of Geneva, suffered from the intensity of the frost. The gardeners remarked in many instances, that the lower part of the tree was frozen, whilst the upper branches remained perfectly uninjured. Localities even have been named where a great number of the trees were found frozen to the height of four or five feet, and remained green above this limit.—*Jameson's Journal.*

ATMOSPHERIC BOW.

ON April 10, a paper was read to the Meteorological Society, from Professor Wartmann, of Geneva, describing an atmospheric bow, seen

on Feb. 12, 1837, in serene weather. It exhibited all the colours of the rainbow in a very distinct manner; it did not, however, appear in a vertical position, like the ordinary rainbow, but inclined to a plane of the earth; it did not partake in any degree of the nature of a halo. It became visible at five minutes past ten, A. M., the sun shining with all its brightness, and lasted till forty-five minutes past ten, A. M. It was not accompanied by any parhelia, nor was there any appearance of cloud till half past eleven, A. M., when a few light clouds were seen passing in the superior strata of the atmosphere; the afternoon was overcast without rain.—*Philosophical Magazine.*

ATMOSPHERIC PRESSURE.

SIR JOHN HERSCHEL has exhibited to the British Association, the curve of the mean annual pressure, as indicated by the barometer, for every hour of the day; and remarked that that little curve conveyed to the mind the very marrow of 8,760 observations. For his part, he had never hoped to see so marked a result obtained in this climate; adding, that it clearly indicated to the eye, the important fact of the difference between the parts of the diurnal curve belonging to the day and to the night.—*Athenæum.*

"RAINING TREES."

SIR JOHN HERSCHEL relates an interesting fact in illustration of this phenomenon, and the manner in which the south-east winds bring up the vapour of the sea. During Sir John Herschel's recent residence at the Cape of Good Hope, on the windward side of the Table Mountain, the clouds were spread out and descended very low, but frequently without any rain falling; while on the lee side, they poured over the precipitous face of the mountain, producing as they were rolled out, the well-known phenomenon of *the Table-cloth.* Sir John, however, found that as he walked under tall fir-trees in the neighbourhood, while those clouds were closely overhead, he was subjected to a copious shower, but, on coming from beneath the trees, it was fair. On inquiring into the cause of this, he found that the cloud was condensed on the trees, and thus the umbrella-shaped tops of the firs acted a part quite the reverse of our umbrellas in this country, for they wetted the person beneath them, instead of keeping him dry.

FALLACIES OF THE RAIN-GAUGE.

PROFESSOR BACHE has read to the British Association a paper "on the Effect of Deflected Currents of Air on the Quantity of Rain collected by a Rain-gauge." His experiments had been made during two and three years, on a high tower in Philadelphia, at the four corners of which he placed gauges of the ordinary construction. The prevailing wind in that part of the United States, and that which brought most rain, was the N. E., and yet he found that when the quantity of rain which fell into the funnel at the N. E. was as 1, that which fell into the opposite side, into the gauge placed at the S. W. angle, was as 2·800; thus proving that the gauges to windward received much less than those to leeward. Professors Robinson and Stevelly consider that if the rain were to fall perpendicularly, it would get into the gauge, but, if a current of air caused it to diverge from the perpendicular, a proportionate quantity of the drops would not reach the interior of the funnel.

Sir John Herschel expressed his opinion that the ordinary rain-gauge, as a scientific instrument, was almost useless; for it could lead to no accurate conclusions, since its indications, by even a change of position of only a few yards, are found to be so materially varied. The effect of these eddy currents on the large and small drops of the same shower must also be different, or the small drops would have their courses more deflected than the large drops, and these would enter the rain-gauge in less quantity. Another effect of these eddies would be, to cause the drops, by clashing in their courses, to coalesce, and thus form large and less easily deflected drops.—*Literary Gazette and Athenæum.*

SUBSTITUTE FOR THE MOUNTAIN-BAROMETER.

SIR JOHN ROBISON has contrived a substitute for the inconvenient mountain-barometer in measuring heights. The principle of this new instrument is very simple, and has been explained by Mr. Russell, to the British Association. It consists of a wooden box, containing a thermometer and a number of tubes, of a bore somewhat wider than those of self-registering thermometers, open at one end, and blown into bulbs at the other, also a small vessel of quicksilver. All the person, who goes up the mountain, has to do, is to note the thermometer, immerse the open end of one of the tubes into the mercury at each station, and then bring down the whole. The examiner then places each bulbed tube, into the stem of which a considerable quantity of mercury will, of course, be found to have entered, under the receiver of an air-pump, either along with a barometer or with a well-made gauge: and on pushing the exhaustion until the mercury stands within the bulbed tube as it did upon the mountain, making certain simple allowances for temperature, the height at which the barometer would have stood at the station on the hill is shewn upon the graduated stem.—*Athenæum.*

TEMPERATURE OF JANUARY, 1838.

MR. WATKINS, of Charing Cross, has communicated to the *Philosophical Magazine* some observations on the low temperature of this month, made by a gentleman in the Blackheath road. The beginning of the month was mild, being above the mean temperature of Greenwich, from twenty years' observations. Towards the 8th, both curves descended far below the mean, and continued so till, on the 20th, just at sunrise, the thermometer stood at 4° below 0 or zero, or 40° below the mean of the period. This low degree of temperature lasted some hours, for at nine A.M., it was — 2°, at ten A.M., + 1½°, at eleven A.M., + 4°, and at noon only + 7°, after which it rose many degrees, and the wind veered from the east to the south. On the 22d both curves ascended *above* the mean, and on the 23rd descended as abruptly *below*, accompanied by a strong easterly gale, which continued until the end of the month.

Two things may be here remarked, as being unprecedented in the annals of meteorology in this country: first, the thermometer below zero for some hours; and secondly, followed, almost immediately after, by a variation of nearly 50°: though it should be noticed that thaws commonly succeed very unusual low degrees of temperature. Before this month, the lowest degree of temperature registered by this observer during thirty years, was + 4°, and that only once, and very transient.

On the night of the 19th and morning of the 20th, the frost was more intense than has been the case for, at least, the period since the commencement of the present century. The registering thermometer in the Arboretum

of the Horticultural Society's garden at Chiswick, was four degrees below zero of Fahrenheit's scale; and some thermometers in the neighbourhood, in more exposed situations, indicated six degrees below zero. The destruction of subjects of the vegetable kingdom was unprecedented in this country, within the memory of any persons now alive.

In all the nursery-grounds about London, a considerable number of the half-hardy shrubby plants were more or less injured. Herbaceous plants, however, sustained little damage, in consequence, perhaps, of the much greater quantity of snow than usual; and of this were examples in those common indigenous species, the rosemary, red Archangel, winter hellebore, snow-drop, daisy, and groundsel, which, during the first week in February, were in full bloom.

The extreme cold, which occurred on the 20th of the month, at Brussels, was 5° Fahr.; this was the coldest January since 1823, which was stated by the same writer to be so low as 1½° Fahr. M. Cruhuy noticed the thermometer at Maestricht, at the coldest period of the same month, to indicate 9¼° below zero.

The remarkably low temperature of the atmosphere during the past year, has given rise to a great many researches, in order to find a parallel to it. The *Journal d'Odessa* has published a very curious table of the periods of extreme cold, and M. Arago having proved, that the climate of Palestine has not changed during a period of 3,300 years, it is fair to conclude, that no permanent alteration has taken place in the climates of the earth. For fifteen centuries, the cold years have alternated with hot years, and sometimes the same year has been remarkable for two extremes.

WEATHER OF 1838.

On October 16, Dr. Lindley read to the ordinary meeting of the Horticultural Society, an abstract of the state of the weather for the first six months in the above year. It appears that during that time, there were not more than 8½ inches of rain, including melted snow, which was a very small proportion to the annual average of 23 inches of rain in the neighbourhood of London. The temperature of this period was never above 80°, and in Jannary, which month was very cold, the thermometer was 4° degrees below zero. The mean temperature of every month was below the annual average of many years up to the month of June, and the same was observed of the succeeding months. The temperature of January was 8½° below the usual average; February 8°; March 1½°; April, nearly 5°; May 4¼°; and June 1¼°. Observation shewed this to have been the coldest as well as the driest season for many years past, and there had been no rain since June to bring up the season to its usual standard.

The winter set in with unusual severity in Russia, and, as we learn from Odessa, in some of the Caucasian provinces the thermometer stood at 22° below the zero of Reaumur, or 17½° Farhr. early in December. The Rhine began to be covered with ice at Oberwesel, on the 20th, and by Christmas-day the river was completely blocked up.—*Galignani's Messenger.*

EXTREME HEAT IN NORTH AMERICA.

In the afternoon of July 28, the thermometer in the piazza of Black's Hotel, in Cumberland, Md., (Lat. 38° 58', N. Long. 77° 33' W.) about two o'clock, was at 102° Fahr.; it gradually rose to 104°; from about three to four o'clock it fluctuated from 102° to 106°; and at about four

o'clock it rose to 107° and then to 108°, where it remained at five o'clock. It was then removed into the direct rays of the sun, when it almost immediately rose to 120°, the highest graduation of the tubes, filled it entirely, and the ball was soon after burst. At Hancock, about thirty miles below, on the Potomac, at the same hour, the thermometer varied from 107° to 109°.—*B. B. Howell; Silliman's Journal.*

EXTRAORDINARY TRANSITION.

ONE of the hottest days of the summer of 1838, was Tuesday, August 28, when the thermometer stood at 83° in the shade. The following day was as cold, wet, and boisterous, as the preceding day had been sultry, fair, and tranquil.—*Norfolk Chronicle.*

RAIN WITHOUT CLOUDS.

ON May 31, at 7h. 2m. P.M., rain fell at Geneva for six minutes, though the sky was perfectly clear in the zenith, and, there were no clouds in the immediate neighbourhood. At first, the drops were large and the rain was thick, but both became thinner towards the end. The rain was lukewarm, and the thermometer just above the ground stood at 18 deg. 15 cent. During the day there had been frequent alternations of wet and dry.—*Prof. Wartmann; Railway Magazine.*

EXPERIMENTAL AEROSTATION.

IN September last, Mr. C. Green, with two other aeronauts, made, with his Nassau balloon, what he terms "an experimental ascent," principally to ascertain whether the same difficulties existed with regard to respiration in a very rarefied atmosphere, by persons ascending with a balloon to any great altitude, as have been felt and described by persons who have ascended lofty mountains. The greatest altitude reached by the aeronauts was 19,335 feet, or three and a half miles and 855 feet. At no period of their voyage, did the aeronauts experience the slightest inconvenience in respect to a difficulty of respiration; they breathed with the utmost ease, and as freely as when walking on the earth's surface.

In September, also, Mr. Hampton ascended with a parachute attached to a gas balloon, from Cheltenham, to the height of 9,000 feet. At this altitude, he cut the connecting cord, when the balloon rose for some hundred feet and burst; Mr. Hampton safely descending in the parachute within thirteen minutes; the collapsed balloon having reached the earth before him.

On May 24, an unsuccessful attempt was made to ascend in a Montgolfier balloon, 130 feet high, 200 feet in circumference.

In an elaborate memoir on the refraction of the atmosphere, read before the Academy of Sciences, M. Biot proposes that each great observatory in Europe should be provided with fixed balloons, rising to different elevations, attaining the greatest possible height, and carrying self-registering instruments for the measurement of the physical elements which characterise the state of the air. If the corresponding refractions were deducted, observations of greater certainty might be made. He thinks it probable that the greatest variations of aerial parabola take place in the inferior layers, which are naturally the most disturbed, and that above them that constancy exists which is now attributed to the whole. Thus, tables of refraction might be formed with constant parabola for the upper regions; and variable corrections might be applied to the lower according to necessity, without which it is impossible to arrive at the true value of the refraction produced by them.—*Athenæum.*

METEOROLOGICAL SUMMARY OF 1838.

(Communicated by DR. ARMSTRONG, *the Retreat, South Lambeth.)*

MONTHS.	TEMPERATURE.					ATMOSPHERIC CHANGES.		HYGROMETER.			VARIETIES OF CLOUD.						
	Fahrenheit.		MEAN.														
	Max.	Min.	Reaumur.	Centigrade.	De Lisle.	Max. pressure in Inches.	Prevailing Winds.	Highest.	Lowest.	Rain in Inches.	Cirrus.	Cirro-stratus.	Cumulus.	Cirro-cumulus.	Cumulo-stratus.	Nimbus.	Stratus.
January	50	2	3	4	149	30.14	SW. NE.	43	9	.075		*	:		*		
February	53	18	*1.75	*2	147	30.30	NE. E. SW.	37	21	4.637	:	*		:		:	
March	59	28	5	6.5	141	29.99	SW. NE.	46	30	.927	:	*	*	:	*	:	
April	67	22	6.5	6.75	139	29.90	W. SW. NE.	48	32	.624	*	*	:	*	:	:	
May	75	30	9	11.5	133	30.08	NW. SE.	52	32	.573	:	*	:	:	:	:	
June	80	40	13	16	126	29.48	SW.	62	50	.523	:	*	*	:	*	*	
July	81	45	13.5	16.75	125.5	30.20	SW.	71	57	2.195	*	*	*	*	:	:	
August	84	40	13.78	17	125.5	29.90	NW. SW.	65	47	1.230	:	*	:	*	:	:	
September	75	37	8.75	11.5	133.5	30.14	SW. NE.	56	44	2.320	:	*	:	:	:	:	:
October	70	27	7	9	137.5	29.38	NE. W.	53	37	1.362	:	*	:	:	:	:	:
November	59	22	4.75	6	140	29.80	SW. NE.	42	28	3.170	:	*	:	:	:	:	:
December	56.5	25	3.5	5	143	30.20	SW. NW.	47	25	1.761	:	*	:		:	:	

Number of Days for the greater part rainy 27. ——— fair 78.
Number of Days fair throughout, but cloudy 140 ——— either clear or cloudless 42

The highest winds were on January 23, 24; February 14, 15, 16, 17; March 16, 17, 23; May 13; June 21, 22; August 22; October 14, 15, 16, 18, 27, 29; November 29, 30; December 2. That on October 29th was the most violent. The highest tides were on February 10, 26, 27; April 26, 27, 28; September 8; October 6, 19; November 29; December 1, 3. Thunder and lightning on May 2, 31; June 1, 12, 18, 19, 29; July 6, 30; August 23; November 28, 29. The meteor, called a lunar rainbow, on September 19. Falling stars not observed. The severest cold was on January 19th, being 2° Fahrenheit. Slight snow on January 8, 9, 10, 11, 14, 18; February 13, 16; April 16, 17, 18, 19, 20. Dense fog on January 12.

In the right hand section of the above Table, the asterisks indicate the prevailing cloud of the month, and the colons the cloud of rarest appearance.

Geographical Discoveries.

EUROPE.

Currents of the English Channel.—M. Monnier has been observing the currents of the English Channel at various points of the French coast, and comes to the conclusion, that their gradual revolution in the period of half a day, is effected in a direction exactly contrary to that which takes place at corresponding hours on the coast of England.—*Athenæum.*

Scotland.—The new Government Survey has been commenced; and there has been resumed the series of primary triangles carried over a great portion of that country in former years by General Mudge and Major Colby.

The Townland Survey of Ireland, on the scale of six inches to a statute mile, (thirty-six times the size of that of England,) or 10560th of the natural scale, proceeds rapidly; the counties of Meath, Leitrim, Longford, and Sligo, contained in 160 sheets, have been completed during the year 1837-8, making fourteen counties and 530 sheets published.

Sweden.—The Swedish Government has recently published a military map, in which are figured the works of public utility, commenced, continued, or finished, under the reign of the present king, Charles-Jean Bernadotte. There are fifteen canals, eight ports and piers, eight roads, nine lines of defence, the expense of which has amounted to 77,177,095fr., all furnished (without borrowing) by the royal treasury.

Novaïa Zemlïa.—Prof. K. E. Von Baer states that the Russian Government having ordered five exploratory expeditions to Novaïa Zemlïa, the first four were useless, but the result of the fifth has been so far satisfactory, that the party have explored the whole of the west, and part of the east coast; and the fact is that the island is reduced from an extent of 12,000 square miles to about one-third of that amount. The land on the west side is mountainous; the mountains being 3,500 and 3,800 feet above the level of the sea, and chiefly composed of black slate. On the east side, the shore is low and barren. There are 100 miles of the north-east shore not yet explored; but we learn from a letter from M. Baer to Dr. Berghaus, (Annalen, No. 154,) that the master Zewolka was to have sailed again last summer, with the intention of wintering at Bucklige Island, in 75° 45′ N., on the west coast; and in the year 1839 was to use all his exertions to sail round the north-eastern point of Novaïa Zemlïa, and there complete the discoveries carried on by the Russian Government.

It is certain that Novaïa Zemlïa, stretching northwards in a direct line about 400 miles, confers inestimable benefits on our quarter of the globe, by screening it completely from the ice which closely invests the coasts of Siberia. Shoals also extend from its northern extremity a long way, (perhaps, westward as far as Spitzbergen,) on which the larger icebergs become fixed, and form an impenetrable barrier. Thus, the enormous quantities of ice which are annually detached from the shores of Siberia,

make their way westward, for the most part, to the north of Spitzbergen, and fall on the coast of Greenland. If Novaïa Zemlïa were to be destroyed by a natural convulsion, the inevitable consequence would be that the coasts of Norway would be continnally beset with ice; the corn-fields, which are now to be found in that country, as far north as the 71st degree of latitude, would be converted into mossy wastes like those of Russian Finland. Our own coasts would be covered with ice, which, accumulating in the North Sea, owing to its form and its shallowness, would greatly depress the climate of our eastern counties, and, perhaps, even change the rich clothing of our cultivated island into the russet garb of Newfoundland.—*From an able and comprehensive paper on M. Baer's recent Expedition; in the Athenæum.*

Scandinavia.—Early in the year the French Government dispatched the *Recherche* frigate, under M. Gaimard, to the North Polar Sea. She was twelve days in harbour in Spitzbergen. Thence she proceeded to Hammerfest, in Norway, where several of the *savans* remained, in order that, with the assistance of Lieut. Due, (who accompanied Hansteen in his Siberian tour,) and Professor Boeck, they might study the natural history of the Scandinavian peninsula, and connect it with that of the Polar regions.

The Survey of the North Sea, under Captain Hewett, R.N., is one of the most important surveys that has been undertaken by the Admiralty; and the most interesting sheet of it, the result of about 100,000 soundings, will be shortly published. Many of the old banks have been found erroneously placed, and wrongly sounded; while numbers of new banks, absolutely unknown before, have been discovered, and others have been doubled in length.—*Capt. Washington.*

Observatories in Russia.—A normal observatory has been founded at St Petersburg, at the *Institût des Mines*, where a certain number of officers receive practical instruction to qualify them to become observers in the establishments in the provinces: eight times a day they observe the atmospheric pressure, the temperature of the air, the humidity of the atmosphere, and the quantity of water which falls either in the form of rain or snow. At some places, they also observe, at the same hours, the magnetic dip and variation; the change in the variation being also observed, at certain times of the year, simultaneously with those set on foot in different parts of Europe. It is proposed also to add to these observations on the temperature of the ground, on atmospheric electricity, and on the intensity of the force of terrestrial magnetism.—*M. Kupffer.*

Levels of the Black Sea and the Caspian.—At the southern extremity of the vast Russian empire, on the limits of Europe and Asia, the long contested question in physical geography, of the depression of the Caspian Sea has been finally set at rest by the trigonometric levelling, from Novo Tcherkask, near the mouth of the river Don, by Stavropol to Kisliar, on the Caspian; whence it results that the level of the latter is 101 feet lower than that of the Black Sea—a remarkable coincidence with the result obtained barometrically by Meyer and Lenz in 1835. The decision of this question is highly creditable to Messrs. Parrot and Struve, who proposed the expedition, and to MM. G. Fuss, Sabler, and Sawitch, who have carried it into effect at the expense of the Russian Government. The most striking fact connected with this inquiry is the little elevation of part of the interior of the East of Europe above the level of the

ocean, since from Kasan to the Icy Sea it is 135 geographical leagues. The city of Berlin, so near the Baltic, is 100 feet above the level of the sea, according to an excellent trigonometric levelling made in 1837, by the able observer M. Bäyer.

Ascent of Mount Vignemale.—The Prince of Moscow states in a letter to the Academy of Sciences, that he has ascended to the summit of this mountain, a feat never before performed. By his own barometric observations, he computes the height to be 2640.8 metres above Luz, and, therefore, 3400.92 above the level of the sea; the trigonometric survey makes it 3354. Like almost all the other difficult hills of the Pyrenees, he says the only side of the ascent is on the Spanish side. A vast circular crater occupies the summit of this mountain, about 200 metres diameter, entirely filled with a glacier, on the borders of which rise four unequal peaks; the highest being opposite the Lac de Gaube. The top of Vignemale is calcareous, not granite, as has been asserted. It occupied the parties about one day and a half, including a night spent in *La Vallée d'Ossone*, to reach the top from Luz, that is, from the 10th to the 11th of August last.—*Railway Magazine.*

Magnetic Observations.—Baron Humboldt invites the leading members of the Geographical Society to propagate Gauss' manner of observing in all new stations, where intelligent persons can be found. Points near the Magnetic Equator, and those which are in high latitudes in the southern hemisphere, as the Cape of Good Hope, Australia, Van Diemen's Land, would be the most desirable, if they would observe at the same epochs indicated by M. Gauss, and followed throughout the North of Asia, in Germany, in Sweden, and at Milan.

ASIA.

Kamchatka.—A map of this remarkable peninsula, shewing the position and giving the heights of its series of volcanoes, or *sopki*, has been completed by M. Erman.

Northern Asia.—The astronomical geography of the North of Asia, will shortly be set right by the publication of the important labours of M. Federow, *élève* of M. Struve, who has recently returned, after a five years absence.—*Letter from Humboldt.*

Trigonometrical Survey of India.—Major Jarvis has read to the British Association a paper explaining what has been done respecting this great work. In the year 1800, the measurement of a meridian arc in India was commenced, which has been carried on to the present time. The total length of the arc is nearly one-sixteenth of the entire circumference of the globe. Two series of triangles diverge laterally from the main trunk connecting Bombay and Calcutta, so that the relative positions of the three principal places in India are accurately fixed. As regards topographical survey, the author recommends the model of the Ordnance Survey of Ireland; and he expects fully to accomplish this survey, accompanied with every sort of useful statistical and geological information, within a period of seven years.—*Railway Magazine.*

Overland Communication with India.—The benefits of this mode of communication with the East were experienced early in the past year: one mail having arrived in forty-nine and the other in fifty days. The former left Bombay on March 2, and brought answers to letters from London, date Jan. 6; thus completing the time out and home in three months,

twelve days. Foreigners arrive daily at Alexandria from the Red Sea, and from Europe. The journey through the Desert will soon be performed with all the conveniences of European travelling. A voyage from Bombay to Trieste will shortly be a party of pleasure. In the year 1838, 300 Europeans crossed the Desert; an English coach is about to be established between Alexandria and Suez.—*Austrian Lloyd.*

East Indies.—M. Solomon Müller has, at length, returned to Heidelberg, after an absence of fourteen years, of which three were spent in Sumatra, and most of the rest in other parts of the East Indies. He has penetrated very far into the interior of Borneo, and has brought from thence a specimen of orang-otang, between six and seven feet in height. —*Magazine of Natural History.*

Navigation of the Indus.—The opening of the Indus has already given an impulse to the native trade, and promises to open new markets for British goods in Candahar, Cabul, and Bokhara, as well as Sinde. Some Parsee merchants have succeeded in navigating the Indus up to Loodenah; and this experiment has been followed by another, a boat having reached that place from Bombay, freighted with English manufactures intended for the Punjaub market. A considerable return trade from the Punjaub to Bombay, in sugar, has also sprung up.—*Asiatic Jour.*

Source of the Oxus.—Lieut. Wood, who served under Capt. Sir A. Burnes, F.R.S., in his expedition to Cabul, states:—"This celebrated river, (the Oxus,) rises in the elevated region of Pameer in Sinkoal. It issues from a sheet of water, encircled on all sides, except the west, by hills, through which the infant river runs; commencing its course at the great elevation of about 15,600 feet above the level of the sea, or within a few feet of the height of Mont Blanc. To this sheet of water Lieut. Wood proposes to assign the name of *Lake Victoria*, in honour of her Majesty."

Ascent of the Euphrates.—At the late meeting of the British Association was read a letter from Lieut. Lynch, Ind. Navy, dated Hit, June 1, 1838, describing the facility with which his steamer had ascended the river from Basrah to that place. Between Hillah and Hit the Euphrates is a broad, deep, and beautiful stream, in some of its bends nearly a mile wide; the country extremely fertile; the crops of corn abundant, and just reaped; the population of Arabs along the banks extensive, and apparently happy, welcoming the approach of the steamer with shouting and dancing, and supplying its wants of fuel with great readiness and cordiality. The productions of the country, as wool, naphtha, bitumen, ghi or butter, tallow, corn in abundance, and horses of the finest breed, are mentioned as easy to be obtained, and in large quantities; the letter concludes with an expression of the writer's conviction that a profitable trade might easily be established; and, after the experience he has had of the river, that there are no physical obstacles to its free navigation with properly constructed vessels. An explanation was then given of maps which were exhibited, and particularly of that shewing the line of levels carried between the Mediterranean at Iskanderûn and the river Euphrates at Birehjik: whence we learn that the city of Antioch is situated 300 feet above the sea—the town of Birehjik, 628 feet; and the highest point between the sea and the river rises 1,720 feet above the Mediterranean.

On May 14, the royal gold medal of the Geographical Society was presented to Colonel Chesney for his distinguished services to geography—as opening the road into a large range of country hitherto very imper-

fectly known; navigating, for the first time in modern history, two of the most celebrated rivers of the ancient world, the Euphrates and the Tigris; adding largely to our knowledge of Syria and Mesopotamia, Assyria and Susiana; carrying on a line of levels from Iskanderún to Bir, and thence, along the whole course of the Euphrates, to the Persian Gulf; and laying down the course of the Orontes from its mouth to Jisr Hadíd.

Persia.—Mr. Taylor Thompson has published an account of the first ascent of the Peak of Demávend by an European, when its height was ascertained barometrically to be 15,000 feet above the sea, and 11,000 feet above the plain of Tehrán.—*Capt. Washington.*

Asia Minor.—Mr. W. J. Hamilton has given the best geological account yet furnished of this singularly elevated table-land; by well-conducted barometrical observations he has measured the height above the sea of its plains and mountain ranges, and been the first to prove that Mount Argæus reaches the great elevation of 13,000 feet.

Palestine.—Messrs. G. Moore and Beek have examined part of the shores of the Dead Sea, and carried a line of soundings across it; and have thus found, by the temperature of boiling water, that the level of the Dead Sea is 500 feet below the level of the Mediterranean. The truth of their experiments has been proved by the results obtained barometrically by Professor Schubert, of Munich; who has lately found the lake of Tiberias to be 500 feet, and the Dead Sea to be 598 *below* the Mediterranean! This is so remarkable a fact, (observes Capt. Washington,) that we hope some traveller, supplied with good instruments, will soon visit Palestine to determine the level of this inland sea, and then explore the country southward along the valleys of El Ghor and El Arabah, a direct distance of only 100 miles, to the Gulf of Akabah, at the head of the Red Sea.

AFRICA.

Algiers.—The rapidly growing intercourse between France and her recent conquest in Africa promises to make us much better acquainted with this territory. Sir Greville Temple and M. de Falbe have published an excellent account of the route from Bonah to Kostantinah; in which we learn that the latter city stands 2,900 feet above the sea. A full report has also been made to the French Government on the present State resources of the newly acquired province; and officers are engaged in the triangulation of the country.

Abyssinia.—By accounts received from M. Russager, dated Urbeith, the capital of Kordofan, on the limits of the explored part of north-eastern Africa, M. R. found the White Nile swarming with *Hippopotami* and crocodiles, and the primitive forests in those regions crowded with new species of birds, apes, &c. He left the White Nile near Ternah, where it is still a noble river; and on his way to Urbeith, (travelling nine days on dromedaries,) saw the tracks of giraffes. A second communication from the same traveller and place, states that he has travelled to the south as far as 10° N. L. with an escort of 300 regular infantry, and 140 horse, all Berbers. The farther he advanced to the south, the more fertile became the country. Palm-trees with smooth trunks, eighty feet in height; sotor-trees, heavily laden with fruit and flowers; Adansonias, measuring fifty feet in circumference;—excited the astonishment of the beholder. Antelopes, leopards, lions, and elephants, were observed in

great numbers in the forests. After ten days, they reached the gold works of Djebel-Tira. The gold is washed from the alluvial soil of the rivulets at the foot of the mountains. This part of Africa was never before trodden by an European. M. de Russager has now accomplished the object of his journey. viz. to inquire into the mineralogical treasures of all the countries subject to Mohammed Ali, from the Taurus in Asia Minor, down to Fasoglo, on the Blue River, or from 37° to 12° N. lat.: his success has been complete, and he feels convinced, that the insulated mountains of tropical Africa, contain inexhaustible treasures of metals.

Sources of the Nile.—It appears by recent accounts from Egypt, that the pasha, in connexion with a political and military expedition into the upper country, contemplates a scientific exploration of Sennaar and the sources of the river; which task he has intrusted to M. Tossizza, the consul-general of Greece, a Turkish officer of his own household, and a Swiss renegade belonging to the arsenal.—*Literary Gazette.*

South Africa.—The important journey from which Captain Sir J. E. Alexander has lately returned, to the north-west of the Cape Colony, through the country of the Great Namaquas, Boschmans, and Hill Dámaras, offers a route of 1,500 miles, which has never appeared in any former map of Southern Africa. Crossing the Orange River at about 100 miles from its mouth, the traveller proceeded to the north-east as far as Nabís, the last missionary station; thence to the north-west, crossing the Oup, or Great Fish River, in the parallel of 27° nearly; then inclining to the northward, he traversed many of its great western tributaries, and reached the Kei Kap, or Great Flat, over which he and his party journeyed as far as the Kópumnas, or Bull's Mouth Pass, a remarkable defile, in the parallel of 24°, winding for a distance of forty miles, between mountains of from 2,000 to 3,000 feet elevation; he then emerged on the Great Desert of Taus, on the verge of the tropic, where the whole party nearly perished from want of water. Overcoming this difficulty, they reached the banks of the river Kúísíp, and followed its western course to the sea, at Walvisch Bay, in lat. 22° 52½′, being the first Europeans that had reached it by land from the Cape of Good Hope. Quitting the sea-coast, Capt. Alexander ascended the Kúísíp River, in an east direction, about 200 miles, to a large village named Niasis, inhabited by the Dámaras of the Hills, in a fertile, well-watered country, abounding with cattle. From this point, the expedition turned southward, crossed many of the western affluents of the Great Fish River, and reached the Orange River at about forty miles from its mouth, after an absence of one year and ten days, bringing with them a large collection of natural history. This journey fills up a great blank in the south-western portion of Africa; the station above mentioned affords a starting point to enable future travellers to traverse the Continent of Africa in the parallel of 23°, and thus connect Capt. Alexander's discoveries on the west with the labours of Dr. Andrew Smith, who reached the tropic in the year 1835, only 300 miles farther to the east.—*Abridged from Capt. Washington's Progress of Geography in* 1837–8; *Journ. Geogr. Soc.*

Considerable exertion is making at the Cape Colony for the erection of a light-house at Cape dar Agulhas, on an isolated hill 270 feet above the sea; the currents round this Cape being more than ordinarily strong. The probable *minimum* expense of erecting a single lantern light-house, with copper head, plate-glass panes, silver reflectors, and argand burners, dwelling for the keeper, and store-room, will be between £1,700 and

£1,800, omitting the items of architect and superintendence; and the yearly expense of lighting, salary, and occasional repairs, from £230 to £240.

AMERICA.

British Guiana.—Schomburgk anticipates that his investigations will be concluded in 1839; when his reports of the country and its productions will be published. Baron Humboldt observes that Schomburgk's latest labours, the ascent of the rivers Coreutyn and Berbice, place him very high in his opinion; and "the zone of hieroglyphic figures, sculptured in the rocks, from Encamazada, in 66° 50′ W. longitude, as far as the eastern limit of British Guiana, a distance of nearly 600 miles, is an ethnographical phenomenon daily increasing in interest."

This persevering traveller has again ascended the Essequibo to its junction with the river Rupununy: following the upward course of the latter he ascended its tributaries, the Rewa and Quitaro, and on Nov. 17, 1837, he had reached the latitude of 2° 31′ N., some miles beyond his extreme point on the former expedition; and was then about to start to explore the mountain range of the Sierra Acaray, and to connect, if possible, his observations with those of Baron Humboldt at Esmeralda, on the Oronoco, already connected with Guayaquil, on the Pacific; and thereby to determine the true breadth of the American Continent, between Guayaquil and Demerara on the Atlantic Ocean.

Position of Cuzco, in Peru.—Mr. J. B. Pentland, H.M. Consul in Bolivia, states, that he has just returned from a two months' tour into the southern provinces of ancient Peru, during which he has visited the capital, Cuzco, and the many interesting localities round that imperial city, following a route hitherto untrodden by scientific travellers. In the course of this journey, he had fixed the position of the city of Cuzco, whence it appears that the Temple of the Sun, now the church of San Domingo, is situated in latitude, south 13° 30′ 55″, long. west of Greenwich, 72° 4′ 10″, and at an elevation above the sea of 11,380 feet. Mr. Pentland had also determined the position of all the principal places between La Paz and Cuzco, and of the western shores of the great interalpine lake of Titicaca. In 14° 33′ S. latitude, Mr. Pentland found perpetual snow on the mountains of Vilcanota, which transversely unite the two chains of the east and west of the great Cordilleras, at a height of 15,800 English feet. The eastern chain of the Cordilleras of Upper Peru, from the parallel of Sorata (15° 5′ S. latitude) to that of Salcantaï (13° 10′), is composed of an almost uninterrupted series of snowy peaks, and the whole of this central chain is a compound of quartziferous porphyry, posterior to the transition slate and new red sandstone formation. At the Nevado de Guaracolta, in 14° 30′ S. latitude, an abundant spring, which issued from the mountain more than eighty yards lower than the limit of perpetual snow, marked +3° 6′ of the centigrade thermometer. Mr. Pentland feels assured that, in the centre of the Andes, it is possible to measure an arc of the meridian which shall extend from 20° to 13° 20′ S. latitude. The soil is perfectly adapted to the measurement of the bases, towards each extremity of the arc.—*Athenæum.*

The Antarctic Seas.—Captain Washington has read to the British Association a paper "on the Recent Expeditions to the Antarctic Seas;" illustrated by a South Circumpolar Chart on a large scale, shewing the the tracks of all former navigators to these seas, from Dirk Gherritz, in 1599, to M. d'Urville, in 1838, including those of Tasman, in 1642; Cook, in 1773; Bellingshausen, in 1820; Weddell, in 1822; Biscoe, in

1831; and exhibiting a vast basin, nearly in extent to the Atlantic Ocean, unexplored by any ship, British or foreign. The writer pointed out that the ice in these regions was far from stationary; that Bellingshausen had sailed through a large space within the parallel of 60°, where Biscoe found ice that he could not penetrate. That where D'Urville had lately found barriers of field-ice, Weddell, in 1822, had advanced without difficulty to the latitude of 74¼°, or within sixteen degrees of the pole; and that it was evident from the accounts of all former navigators, that there was no physical obstacle to reaching a high south latitude, or, at any rate, of ascertaining those spots which theory pointed out as the positions where, with any degree of probability, the southern magnetic poles will be found

French Expedition.—A letter from Captain Dumont d'Urville, dated "Island of Conception, April 10, 1838," announces the arrival in that harbour of the corvettes *Astrolabe* and *Zelée*, sent by the French Government on a voyage of discovery to the Austral regions. After remaining an entire month in the Straits of Magellan, M. d'Urville left them on the 8th of January, and, steering towards the south, came within view of the first mountains of ice on the 15th. Seven days afterwards, at break of day, his progress was checked by a solid barrier of ice, which he sailed along a distance of 240 miles, from lat. S. 64 deg. to 61 deg. (near the New Orkney Islands). On the 2d of February he continued to advance southward, and on the 4th, being in lat. S. 62 deg., the two corvettes were so hemmed in on all sides that Captain d'Urville was beginning to despair of extricating them, when, on the 9th, he availed himself of a strong E.S.E. wind to hoist all sails, and so got clear of it. He then coasted the barrier of ice for a distance of 300 miles, without perceiving any opening, and on the 15th, having reached the 33rd deg. of long. (Paris), after visiting the points explored by Weddell, and seeing the rampart of ice extending northward towards the Sandwich Islands, he proceeded westward by the New Orkney Islands, the eastern part of those of New Shetland, and, turning again to the south, he explored between the 63rd deg. and 64th deg. of latitude, a hitherto unknown region, for a distance of 180 miles. Crossing the whole of the straits of Bransfield, he left the Austral shores on the 7th of March, after a most painful navigation of fifty-two days among the ice. The crews being much fatigued, and the scurvy having manifested itself with considerable intensity among them, particularly on board the *Zelée*, Captain d'Urville determined on making for the nearest harbour of the coast of Chili, and safely reached the Bay of Conception on the 7th of April. The expedition must, therefore, be considered to have completely failed, the vessels not being able to penetrate beyond 64° south, being fully 10° short of the parallel reached by Weddell.

It is gratifying to add that in August, an expedition fitted out by several merchants, but chiefly under the direction of that spirited individual, Mr. Charles Enderby, sailed for the South Seas. The expedition consisted of two vessels, the *Eliza Scott*, Master, Captain Belemy, and the *Sabrina*, Captain Freeman. Their orders were to proceed to the south-west point of Chalky Bay, New Zealand, then to the southward in as high a latitude as practicable, directing their course westward until they fall in with Enderby's Land, 3,000 miles in the high latitudes. The return of this expedition may be expected in July or August next.

"The United States South Sea Surveying and Exploring Expedition" sailed from Hampton Roads, Norfolk, Va. on August 18. The follow-

ing is a list of the vessels constituting the squadron: the *Vincennes*, a first-class sloop of war, of 650 tons, commanded by Charles Wilkes, Esq., commander-in-chief of the expedition. A light spar has been put on this ship, which gives her the appearance and some of the conveniences of a small frigate: her battery is reduced to eight guns, and she carries about 150 men. The *Peacock* is a second-class sloop of war, of 600 tons, and of the same construction, carrying 130 men and eight guns. The store-ship, *Relief*, 450 tons, seventy-five men and six guns: the brig *Porpoise*, 200 tons, sixty-five men, and four guns: the schooner *Sea-Gull*, 110 tons, fifteen men; and the schooner *Flying Fish* is of ninety tons, and carrying twelve men. "The results of this noble undertaking," observes Professor Silliman, "will, we doubt not, prove of the greatest value to the cause of science, and to the nautical and commercial interests of the nation; and the officers of the various vessels, and the members of the scientific corps which accompanies them, are gentlemen of ample qualifications for the arduous and honourable duties assigned to them."

Discovery of the North-west Passage:—Just half a century has elapsed since Alexander Mackenzie, in 1789, first descended the great river which so justly bears his name, and reached the waters of the Polar Sea. —In 1826 Sir J. Franklin and Capt. Back followed Sir A. Mackenzie's course to the mouth of the river which bears his name, and coasted 370 miles of the Polar Sea to the westward, tracing the northern shores of America till within 160 miles of Point Barrow, which was reached by Mr. Elson, the master of the vessel under the command of Captain Beechy, only four days after Franklin had been obliged to return. The intermediate portion has hitherto remained a blank on our maps; but the unexplored country between Franklin's Return Reef, in lat. 70° 26′ N., long. 148° 52′ W., and Point Barrow, in lat 71° 23′ 33″ N., long. 156° 20′ W., has been, as the public have recently learned, successfully traced by Messrs. P. M. Dease and Thomas Simpson, acting under the instructions of the Hudson's Bay Company, issued by their resident Governor, Mr. George Simpson, to whom the formation and equipment of the expedition had been intrusted. The party started from Fort Chipeweyan on the 1st of June, 1837, reached the ocean by the most westerly mouth of the Mackenzie on the 9th of July, and Franklin's Return Reef on the 23rd, where their survey commenced. They proceeded by sea to explore the coast, until they arrived, on July 31st, at a point which they subsequently named Boat Extreme, in lat 71° 3′ 24″ N., and long. 154° 26′ 30″ W. There now appearing little prospect of their being able to reach Point Barrow by water, Mr. T. Simpson undertook to complete the journey on foot, and accordingly started on the 1st of August with five men, Mr. Dease and the other five men remaining in charge of the boats. On August 4th (apparently) Mr. Simpson reached Point Barrow. The party arrived at the western mouth of the Mackenzie, on their return, on the 17th of August, and at Port Norman, on the 4th of September, whence their report is dated on the following day.

The expected further results of the expedition in the past summer, will be understood by the following extract from Mr. G. Simpson's instructions to the explorers: —"The object is to trace the coast from Franklin's Point Turnagain eastward to the entrance of Back's Great Fish River. To that end you will haul your boat across, from the north-eastern extremity of Great Bear Lake to the Coppermine River, before the winter breaks up, and at the opening of the navigation proceed to

the sea, and make as accurate a survey of the coast as possible, touching at Point Turnagain, and proceeding to Back's Great Fish River, if the strait or passage exists which that officer represents as separating the main land from Ross' Boothia Felix; but should it turn out, on examination, that no such strait exists, and that Captain Ross is correct in his statement, that it is a peninsula, not an island, you will in that case leave your boat and cross the isthmus on foot, taking with you materials for building two small canoes, by which you may follow the coast to Point Richardson, Point Maconochie, or some other given spot, that can be ascertained as having been reached by Captain Back. And you will be regulated in determining whether you will return to Great Fish River, or by the coast, by the period of the season at which you may arrive there, the state of the navigation, and other circumstances. In order to guard against privation, in the event of your returning to Great Fish River, it will be advisable to make arrangements at Great Slave Lake, that a supply of provisions, with ammunition and fishing-tackle, babiche for snow-shoe lacing, be deposited at Lake Beechey, or some other point of that route. Should you be unable to complete the voyage to the eastward from Coppermine River in one season, you may take up your quarters with the Esquimaux for the winter, so as to accomplish it the following season."—*Philosophical Magazine.*

On May 3, a letter from Dr. Richardson, upon this Expedition, having been read to the Geographical Society, Sir John Barrow observed that "twenty years had now elapsed, since he first gave an opinion on the subject of arctic discovery; and he then came to the conclusion, from reading the voyages of all the older navigators, that there existed an open navigable sea, unencumbered by ice, except occasionally, when near islands or the shore. This opinion had been confirmed by the accounts of Parry, Franklin, and Ross, and now Messrs. Dease and Simpson have spoken clearly to the same effect. Indeed, we now knew that the coasts of America and Asia extended only to about seventy degrees of latitude, which gave reason to believe in the existence of a polar basin of forty degrees, or 24,000 miles in diameter; and, could it be supposed that in such an extent there was not an open sea?—*Literary Gaz.*

AUSTRALIA.

Australia is a Continent 2,500 statute miles in length, with an average breadth of half that quantity: it contains an area of 3,000,000 statute miles, and it is only one-sixth part less than the whole of Europe: and, if we reckon the population of Europe at 186,000,000, Australia may, at a future day, on the same scale of density, possess a population of 153,000,000.—*Captain Veitch; in Journ. Geog. Soc.*

New South Wales.—Detailed narratives of the three journeys of Major Mitchell into the interior have been published. A map of the Colony of New South Wales, drawn and *engraved* at Sidney, represents better than any other we have seen, the great physical features that mark the face of the country. At Port Philip, a town named Melbourne has been founded at the north-eastern angle of the bay; and is rapidly increasing.

South Coast.—The colony established on the east side of St. Vincent's Gulf, have laid the foundation of a town called Port Adelaide; its capabilities are fast improving; for, on June 26, twelve vessels, three of them of 500 tons burthen, were laying there.

A letter from Mr. G. W. Earl, on board H.M.S. *Alligator*, Sydney,

Aug. 21, 1838, states, that the vessel touched at Adelaide, and reports favourably of the colony, especially of the docility of the natives. In features, they are remarkable for an extraordinary projection of the brow, immediately above the eyes, and are unlike any that the writer had seen either on the west or east coast; their language also differs entirely from that spoken in any other parts of the country: it abounds in vowels, and is very soft to the ear.

The *South Australian Record*, of Sept. 1, contains the report of Capt. Sturt, to the acting governor, on having accomplished an overland journey from Sydney to Adelaide, which latter town now contains a population of about 4,000 persons. This route, hitherto attempted, but deemed impracticable, will be of vast importance to the colonists.

The entrance to Lake Alexandria, and the river Murray from the sea, has recently been thoroughly explored by Captain Gill, and found to be safe for vessels of moderate tonnage; and there is room and depth of water inside for the British navy. An arm of the lake, believed to be navigable, extends eastward as far as Baudin's Reefs, nearly to the boundaries of the province, thus rendering accessible the greater part of that fertile district, the Australia Felix of Major Mitchell.—*South Australian Gazette.*

Dr. Lhotsky, in detailing the physical features of the south-eastern angle of Australia, states Mount William, the loftiest point in the Warragong chain, (misnamed Australian Alps on our maps,) to be 8,200 feet above the level of the sea.

North-west Coast.—Messrs. Grey and Lushington sailed from the Cape on the 20th of October, and on the 3rd of December reached Hanover Bay, at the outlet of Prince Regent's River, in lat. 15° 20′ S., long. 124° 40′ E. Having landed, and pitched their tents in a beautiful valley now for the first time trodden by European feet, and having formally taken possession of this part of the country in the name of Her Majesty, the schooner, under charge of Mr. Lushington, was dispatched to Coepang, in the island of Timor, distant about 300 miles to the north, to embark ponies, of which six and twenty were obtained, at the rate of about £2 each, chiefly in exchange for muskets and powder. During the vessel's absence, Mr. Grey and his party examined the tract in the immediate vicinity of their camp, and explored a small stream which watered the valley, for about five miles to the southward. The country generally, as viewed from the sea, promises well; but on landing, the first appearance is monotonous and sterile; being composed of rocky hills of sandstone about 300 feet in height, covered with brushwood and prickly grass; but between these hills are beautiful valleys, the soil of which is fertile; and here fresh water may always be found. The huts of the natives consisted of a conical frame-work of wood, about four feet high and ten feet diameter at the base, and were well and neatly made. The natives were evidently in possession of sharp-cutting instruments, and many large trees were seen with notches or steps cut in them, by means of which they ascend for the purpose of stripping off the bark, which furnishes them with all the clothes they need in this fine climate; the hatchets may probably be of stone. On the return of Lieut. Lushington from Timor with the ponies and other necessaries, on the 1st of February, the expedition started for the interior. They proceeded first about fifteen miles in a nearly due south direction, until they had reached the parallel of 15° 29′ S. lat. The whole of the country

lying between this point and Hanover Bay was composed of ridges of sandstone, of no great elevation, but intersected by deep ravines. After passing the parallel of 15° 29′ S. they entered upon a very rich tract of country, that even surpassed in fertility that small portion of the Brazils which they had had an opportunity of seeing. A large expanse of water having been seen a little to the west of south, they were induced to pursue that direction, and still found the country to be of the same rich and luxuriant character. Upon attaining the parallel of 15° 43′ S. lat., and 124° 44′ E. long., they found themselves upon the banks of a considerable river, which Lieut. Grey named Glenelg River, in testimony of the obligations which the expedition were under to the Principal Secretary of State for the Colonies.

Having advanced to 16° 31′ S. lat. and 125° 15′ E. long., without discovering any other large river, they returned to Hanover Bay, on March 15, where they met Captain Wickham, R.N., in command of H.M.S. *Beagle*, (having sailed from Swan River, Jan. 4, 1838,) who had, after a careful examination of the coast, arrived at the same conclusion, viz., that no large river could exist between the one that they had discovered, and *Fitzroy River*, which he had discovered at the south part of the great opening behind Dampier's Land. These rivers, although of considerable magnitude, are still utterly insufficient to account for the drainage of this vast Continent; and this interesting question, instead of being at all placed in a clearer point of view by the united exertions of these two expeditions, is, if possible, at this moment involved in deeper obscurity and mystery than ever.

Captain Wickham's main discovery is having ascertained the southern part of King's Sound to terminate in the mouth of a river, which he has named Fitzroy River, in compliment to Captain Fitzroy, R.N.; it is in lat. 17° 34′ S., and long. 123° 38′ E. nearly. "This appears," adds Captain W., "to be a very extraordinary part of the world; the whole coast on the western side of King's Sound, also the entire coast between Roebuck Bay and Point Swan, being entirely of sandstone, whereas, the islands and all the high land on the eastern side are entirely of quartz, and of so rugged an outline, that it is difficult to proceed in any direction. The islands are almost void of vegetation, and the whole seem to be thrown up in such fantastical shapes as to lead one to suppose this part of the world to be in the last stage of utter ruin and confusion. From Valentine Island, (where the cliffs end,) the land is very low, and continues so to the banks of Fitzroy River." Capt. W. fears this river will never become of any service, owing to its distance from the sea, and the risk in approaching it; but, he is of opinion that, if a party is ever to reach the interior of Australia, it must be by its banks: the wood is no where so thick as to be an obstacle, and there would be a certain supply of good grass.

North Coast.—The expedition to establish a settlement at Port Essington, on the north-coast of Australia, sailed from England in the beginning of the year. It consisted of two vessels commanded by Sir Gordon Bremer, and Lieutenant Owen Stanley.

POLYNESIA.

Voyage of the Bonité.—The following is a brief summary of the scientific labours of the officers on board the *Bonité*, during her recent voyage round the world. The voyage was completed in 631 days, during which the corvette only anchored 151 days: it has, therefore, been a matter of surprise that so much should have been done

for Zoology; for among a considerable collection of rarities five have been added, which form types of new genera, and of which there was either no vestige in museums, or only imperfect specimens; and besides these there are many new species. Among the Chinese fishes are several, which tend to confirm the truth of Chinese drawings, in many instances reckoned fabulous. The class of insects has been equally enriched. The *Arachnida* and *Crustacea* have received important augmentations; the numerous drawings of *Mollusea*, extending even to the microscopic orders, prove that in the open sea there has been equal activity; and, 4,000 observations on the temperature of the human body attest the fact that it rises and falls with that of the atmosphere. The phosphorescence of the sea has been an object of continued research, and the organized beings which cause it have been preserved in spirits of wine. To all this wealth in Natural History may be added a portfolio of more than 200 drawings and numerous accurate descriptions. With respect to Physics; observations with the barometer, thermometer, and other instruments have been made every hour of the day and night. Seven experiments, made with the apparatus of Mr. Biot, to ascertain the composition of sea-water at a great depth, have produced some unexpected results; and among other things, terrestrial magnetism has been carefully studied. M. Gaudichaud has been equally indefatigable with respect to Botany, and has brought back an immense collection of woods, plants, fruits, seeds, drawings, and notes. A tree-fern, the *Cyathea arborea*, from which some pieces of the trunk were taken, measured forty feet, and was not the largest seen in Bourbon. M. Gaudichaud has sown several seeds, and has also brought three young plants of the Dragon-tree, (*Dracæna draco*,) three of the Chili palm, (*Cocos Molinii*,) besides several other palms.—*Athenæum*.

The Asiatic Archipelago.—Mr. James Brooke, a well-known member of the Western Yacht Club, sailed in October last from Plymouth, in his schooner yacht *Royalist*, of 140 tons, upon an exploring expedition to the Asiatic Archipelago. To this gentleman we are already indebted for an account of the Gulf and Island of Symi, printed in the last volume of the *Journal of the Geographical Society*. Mr. Brooke proceeds to Singapore, where his researches are to commence; subsequently examining some of the interesting groups of the Pacific, returning to England by Cape Horn. The vessel is well equipped with all the requisite instruments for observation, including three chronometers, and the means for collecting and preserving specimens of Natural History.

Among the objects in view are a general knowledge of Mallúdú Bay; inquiries for the settlement of Cochin-Chinese, reported by Earl to be fixed in the vicinity of Bankoka; and in the large country of the Bughis, called Calibes, equal to Borneo in riches, and superior in picturesque beauty to any part of the Archipelago. This is stated to be the first instance of any gentleman devoting his life and fortune to the attainment of geographical knowledge in these distant and dangerous seas. The voyage is expected to occupy about three years. The yacht is armed with six guns, and carries 20 men, and is in every way prepared for the pirates of those seas. Mr. Brooke has presented to the Geographical Society, the plan of his expedition, an outline of which will be found in the Society's *Journal*, vol. viii. part 3.

Obituary

OF PERSONS EMINENT IN SCIENCE AND ART.

1838.

Dr. Nathaniel Bowditch, F.R.S., the celebrated American Mathematician. (*See Frontispiece to the present Volume.*) Dr. Bowditch was born at Salem, in the State of Massachusetts, on March 26, 1773. (The vignette, beneath the Portrait, represents a plain two-story house, in Danvers, near the junction of several roads, in Essex county; it has but two small rooms in it, and here Bowditch dwelt when a child, with his mother.) He was removed from school at the age of ten years to assist his father in his trade as a cooper; and was indebted for all his subsequent acquisitions, including the Latin and some modern languages, and a profound knowledge of mathematics and astronomy, entirely to his own exertions, unaided by any instruction whatever. He became afterwards a clerk to a ship-chandler, where his taste for astronomy first shewed itself; and, in the year 1788, when he was only fifteen years old, he calculated an almanac for the year 1790, the manuscript of which is still in the possession of his family. His subsequent occupation as supercargo in a merchant vessel sailing from Salem to the East Indies, led naturally to the development of his early tastes, by the assiduous study of those departments of that great and comprehensive science which are most immediately subservient to the purposes of navigation. It was owing to the reputation which he had thus acquired for his great knowledge of nautical astronomy, that he was employed by the booksellers to revise several successive editions of Hamilton Moore's *Practical Navigator*, in two of which he actually discovered and corrected 8,000 errors in the nautical tables. He afterwards replaced the *Practical Navigator* by an original work on the same subject, remarkable for the clearness and conciseness of its rules, for its numerous and comprehensive tables, and for its perfectly practical character as a manual of navigation: this work, which has been republished in this country, has been for many years almost exclusively used in the United States of America.

Dr. Bowditch having been early elected a Fellow of the American Academy of Arts and Sciences at Boston, commenced the publication of a series of communications in the Memoirs of that Society which speedily established his reputation as one of the first astronomers and mathematicians of America, and attracted likewise the favourable notice of men of science in Europe.

In 1802, he received the honorary degree of Master of Arts, in the University of Havrard. On quitting the sea, in 1803, he was appointed acting president of an insurance company at Salem, the duties of which he discharged till the year 1823: in 1806, he was chosen Hollis Professor of Mathematics at Havrard University, wherein he received the degree of LL.D. in 1816. In 1823, he was actuary of the Massachusetts Hospital Life Insurance Company: the income which he derived from these employments, and from the savings of former years, enabled him to abandon all other and more absorbing engagements, and to devote his leisure hours entirely to scientific pursuits.

In 1815, Dr. Bowditch began his great work, the translation of the *Mécanique Céleste* of Laplace. The American Academy, over which he presided from the year 1829, at an early period of the progress of this costly undertaking, very liberally offered to defray the expense of printing it; but Bowditch preferred to publish it from his own limited means,

and to dedicate it as a splendid and durable monument of his own labours, and the state of science in his country. The first volume of this work was published in the year 1829, the second in 1832, and the third in 1834; each volume containing about 1,000 quarto pages. The fourth volume was nearly completed at the time of his decease. He persevered to the last in preparing the copy and reading the proof-sheets in the intervals when he was free from pain. "The last time," says the Rev. A. Young,* "I saw him, a few days previous to his death, a proof-sheet was lying on his table, which he said he hoped to be able to read over and correct." He died in March last, in the sixty-fifth year of his age, after a life of singular usefulness and most laborious exertion, in the full enjoyment of every honour which his grateful countrymen in every part of America could pay to so distinguished a fellow citizen.

Dr. Bowditch was, in 1818, elected a Fellow of the Royal Society of London, an honour which few Americans have attained. He was also a Fellow of the Royal Societies of Edinburgh and Dublin: of the Astronomical Society of London; of the American Philosophical Society, at Philadelphia; of the Connecticut Academy of Arts and Sciences; of the Literary and Philosophical Society of New York; and corresponding member of the Royal Societies at Berlin, Palermo, &c.

An interesting parallel may be drawn between the lives of Franklin and Bowditch, unquestionably the two greatest proficients in science that America has produced. Both rose from obscure situations in humble life, and from the straits of poverty: both left school at the age of ten years to assist their fathers in their shops: both had an early and passionate love of reading: both had the same habits of industry, perseverence, and temperance. H. R. H. the late President of the Royal Society observed in his Anniversary Address: "When we consider the circumstances of Dr. Bowditch's early life, the obstacles which opposed his progress, the steady perseverance with which he overcame them, and the courage with which he ventured to expose the mysterious treasures of that sealed book, which had hitherto only been approached by those who had been cleared for them by a systematic and regular mathematical education, we shall be fully justified in pronouncing him to be a most remarkable example of the pursuit of knowledge under difficulties, and well worthy of the enthusiastic respect and admiration of his countrymen, whose triumphs in the field of practical science have equalled, if not surpassed, the noblest works of the ancient world."

The Portrait and Autograph prefixed to this work have been copied from a plate, engraved by G. F. Storm, from an unfinished painting in the possession of the family of Dr. Bowditch—and the last work of Stuart. It is a touching memorial of the nobility of genius—a fine study for the phrenologist—and an illustration of human character which must be acceptable to all.

THOMAS ANDREW KNIGHT, Esq., F.R.S., F.L.S., *President of the Horticultural Society;* one of the most original, ingenious, and eminent of vegetable physiologists, and distinguished equally as a horticulturist. The important results of Mr. Knight's labours are to be found in the *Transactions* of the Royal Society, and in those of the Horticultural Society, and in the gardens and orchards of this country. His labours were directed not only to the advancement of vegetable physiology, but to use-

* Silliman's *Journal*, No. 71.—A reprint of Mr. Young's "Life and Character," with "An Eulogy," by John Pickering, is announced for immediate publication in London.

ful practical results; and in the interesting labours of the garden, orchard, and forest, the practical man has found sagacious and useful explanations and directions in the writings of Mr. Knight for his guidance.—*Anniv. Address Linnæan Soc.*

NATHANIEL WINCH, Esq., an excellent British botanist; author of *An Essay on the Geographical Distribution of Plants through the Counties of Northumberland, Cumberland, and Durham*; of a very elaborate *Flora of Northumberland and Durham*, &c.

SIR RICHARD COLT HOARE, Bart., F.R.S., a munificent patron of antiquities and the fine arts, and the author of many valuable historical and topographical works, more especially the history of his native county, (Wilts.) presenting so numerous and such splendid funereal and other monuments of the primitive inhabitants of Great Britain; which he investigated with a perseverance and success unrivalled by any other antiquary.—*Anniv. Address Royal Society.*

The REV. THOMAS CATTON. F.R.S., practical and theoretical astronomer, who succeeded Mr. Ludlam in the management of the observatory of St. John's College, Cambridge. He was a most scrupulous and skilful observer; and he is known to have left behind him a very large mass of observations, particularly of occultations, most carefully detailed and recorded.

Mr. HENRY EARLE, F.R.S., one of the most skilful and scientific surgeons of his age.

Dr. ALEXANDER MURRAY, author of the *Northern Flora.*

Mr. SAMUEL WOODWARD, of Norwich, author of *A Synoptical Table of British Fossils*, and a small work on the Geology of Norfolk.

JAMES STUART, of Pinkie, near Musselburg, aged 80; sixty-four years a practical gardener; and "the father of the profession."

Dr. F. F. NEES VON ESENBECK, professor of Pharmacy and Botany in the University of Bonn.

PIERRE LOUIS DULONG, one of the most profound chemical philosophers of the age, "and almost equally distinguished for his profound knowledge of chemistry and of physical philosophy. His 'Researches on the mutual decomposition of the soluble and insoluble Salts,' form a most important contribution to our knowledge of chemical statics. He was the discoverer of the *hypophosphorous acid*, and also of the *chlorure of azote*, the most dangerous of chemical compounds, and his experiments upon it were prosecuted with a courage nearly allied to rashness, which twice exposed his life to serious danger; and his memoirs on the 'Combinations of phosphorus with oxygen.' on the '*hyponitric acid*,' on the '*oxalic acid*,' and other subjects, are sufficient to establish his character as a most ingenious and accurate experimenter, and as a chemical philosopher of the highest order. But, it is on his researches on the 'Law of the conduction of heat,' 'On the specific heat of the gases,' and 'On the elastic force of steam at high temperatures,' that his permanent fame as a philosopher will rest more securely: the first of these inquiries, which were undertaken in conjunction with the late M. Petit, was published in 1817; and presents an admirable example of the combination of well-directed and most laborious and patient experiment with most sagacious and careful induction: these researches terminated, as is well known, in the very important correction of the celebrated law of

conduction, which Newton had announced in the *Principia*, and which Laplace, Poisson, and Fourier, had taken as the basis of their beautiful mathematical theories of the propagation of heat. His experiments on the elastic force of steam at high temperatures, and which were full of danger and difficulty, were undertaken at the request of the Institute, and furnish results of the highest practical value; and though the conclusions deduced from his 'Researches on the specific heat of gases' have not generally been admitted by chemical and physical philosophers, the memoir which contains them is replete with ingenious and novel speculations, which shew a profound knowledge and familiar command of almost every department of physical science." (*Anniv. Address Royal Soc.*) An affecting trait of "the ruling passion strong in death" in this great philosopher is related at page 133 of the present volume.

Frederic Cuvier, the younger brother of the illustrious Baron Cuvier, Professor of Animal Physiology to the Museum of Natural History at Paris, and Inspector-General of the University. His appointment as keeper of the Menageries at the Jardin des Plantes, furnished him with the most favourable opportunities of studying the habits of animals, their physiology and structure. The *Annales d'Histoire Naturelle*, and the *Memoires du Muséum*, contain a series of his memoirs on zoological subjects of great value and interest; and his work *Sur les Dens des Mammifères considerées comme Caractères Zoologiques*, has always been considered as one of the most valuable contributions which has been made to the science of zoology in later times: the great work *Sur l'Histoire des Mammifères*, of which seventy numbers have been published, was undertaken in conjunction with Geoffroy St. Hilaire, and is the most considerable and most extensive publication on zoology which has appeared since the time of Buffon.—*Address of the President of the Royal Society.*

Count Gaspard Sternberg, a distinguished naturalist. His principal work, an antediluvian Flora, published in French and German, has long been highly appreciated by the scientific world.—*Times.*

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Professor Moll.

MEETINGS OF THE LITERARY AND SCIENTIFIC INSTITUTIONS OF LONDON, 1838-39.

Societies.	November.	Dec.	January	February.	March.	April.	May.	June.	Time of Meeting.
Royal Society	15, 22	6,13,20	10,17,24,31	7,14,21,28	7, 14, 21	11, 18,-25	2, 9, 16, 30	6, 13, 20	Thurs. 8½ P.M.
Society of Antiquaries ...	15,22,29	6,13,20	10,17,24,31	7,14,21,28	7, 14, 21	11,18, 25	2, 9, 16, 30	6, 13, 20	Thurs. 8 P.M.
Royal Institution............	...	...	18, 25	1,8,15,22	1,8,15,22	12,19,26	1,10,17,24,31	7, 14	Friday, 8½P. M.
Royal Geographical Soc.	12, 26	10	14, 28	11, 25	11, 25,	8,22	13, 27	10, 24	Monday, 9 P.M.
Geological Society	7, 21	5, 19	9, 23	6, 27	13, 27	10, 24	8, 22	5	Wednes.8½P.M.
*Linnean Society	6, 20	4, 18	15	5, 19	5, 19	2, 16	7	4, 18	Tuesday,8 P.M.
*Horticultural Society...	6	4	15	5, 19	5, 19	2, 16	7, 21	4, 18	Tuesday,3 P.M.
Zoological Society	1	6	3	7	7	4	2	6	Thursd. 3 P.M.
Zoological Society	13,27	11	8, 22	12, 26	12,26	9, 23	14, 28	11, 25	Tuesday 8½P.M.
*Entomological Society	5	3	7	4	4	1	6	3	Monday, 8 P.M.
Statistical Society	19	17	21	18	18	15	20	17	Monday, 8 P.M.
Astronomical Society	9	14	11	8	8	10	10	14	Friday, 8 P.M.
Phrenological Society ...	5,19	3,17	7,21	4,18	4,18	1, 15	6, 20	...	Monday,8½ P.M.
Society of Arts	7,14,21,28	5,12,19	9,16,23,80	6,13,20,27	6, 13, 20, 27	3,10,17,24	1,8,15,22.29	5, 12	Wednes 7½ P.M.
Society of Arts	13	11	8	12	12	9	14	11	Tuesday,8 P.M.
Royal Soc. of Literature	22	13, 27	10, 24	14, 28	14, 28	11, 25	9, 23	13 27	Thursd. 4 P. M.
Royal Asiatic Society......	...	1,15	5,19	2,16	2, 16	6, 20	11	15	Saturday,2P.M.
Royal Col. of Physicians	...	...	...	...	...	...	...	...	Monday, 9 P.M.
Royal Medical and Chirurgical Society	13, 27	11	8, 22	12, 26	12, 26	9, 23	14, 28	...	Tuesd. ,8½ P.M.
Medico-Botanical Society	14, 28	12	9, 23	13, 27	13, 27	10, 24	8, 22	12	Wednes 8 P. M.
Medical Society	5,12,19,26	3,10,17	14,21,28	4,11,18,25	4,11,18,25	1,8,15,22,29	6,13,20,27	...	Monday, 8 P.M.
Harveian Society	3,17	1,15	5,19	2,16	2, 16	6, 20	4,18	...	Saturd. 8½ P.M.
Westmins. Medical Soc.	3,10,17,24	1,8,15	5,12,19,26	2,9,16.23	2,9,16,23	6,13,20,27	4,11,18,25	1,8,15,22,29	Saturd. 8 P.M.
Instit.of Civil Engineers	...	...	8, 29	5,12,19,26	5,12,19,26	9,16,23,30	7,14, 28	...	Tuesday,8 P.M.
Architectural Society ...	6, 20	4,18,26	1,15.29	12. 26	12, 26	9, 23	7, 21	4,18	Monday, 8 P.M.

Anniversaries.—Royal, Nov. 30, 11 A.M.—Antiquaries, April 23, 2 P.M.—Royal Institution, May 1.—Royal Geographical, May 21, 1 P.M.—Geological, Feb. 15, 1 P.M.—Linnean, May 24, 1 P.M.—Horticultural, May 1, 1 P.M.—Zoological, April 30th, 1 P.M.—Entomological, Jan. 22, 8 P.M.—Statistical Society, March 15, 3 P.M.—Astronomical, Feb. 8, 3 P.M.—Phrenological, March 31, 8 P.M.—Royal Society of Literature, April 26, 4 P.M.—Asiatic, May 5, 1 P.M.—College of Physicians (Harveian Oration), June 25, 4 P.M.—Royal Medical and Chirurgical Society, March 1.—Medico-Botanical, Jan. 16, 8 P.M.

The British Association will meet in August next, at Birmingham.

* These Societies continue their Meetings throughout the year.

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